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ABSTRACT

Designed to support the formation of a New York State Office of Communications Management, this document contains official recommendations, cost justifications, public hearing testimonies, and government documents which address the need for a statewide control of telecommunications. A year-long, 12-step plan for implementation of a State Office of Communications Management and two reports--"Telecommunications in New York State: Background and Educational Capacities" (Gregory M. Benson, Jr., Carol Ann Stiglmeier, and Peter F. Stoll) and "Electronic Highways: The New Roads Needed for Excellence in the Empire State" (Gregory M. Benson, Jr.)--are presented as the first 2 of the 13 annexes that make up the document. The remaining annexes provide supporting data as follows: (1) Letter of Support from AT&T; (2) Actual Bill (Cost of Communications); (3) Summary Report on Public Hearings on Emergency Communications in New York State; (4) An Example of Concerns of Counties; (5) NYNEX Press Release "SUNYNET"; (6) Examples of Other States' Solutions for Communications Problems; (7) Examples of Why Bill Is Needed; (8) A Preliminary Review of Satellite-Based Education; (9) Special Problems in Telecommunications in Rural America; (10) Press Releases Concerned with the Problem; and (11) Examples of Redundancy (state maps). (JB)

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DATA SUPPORTING CREATION

OF

OFFICE OF COMMUNICATIONS MANAGEMENT

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DATA SUPPORTING CREATION

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OFFICE OF COMMUNICATIONS MANAGEMENT

SPONSORED BY

SENATOR JAMES H. DONOVAN

PREPARED BY

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ANNEX A

IMPLEMENTATION PLAN
FOR THE
STATE OFFICE OF COMMUNICATIONS MANAGEMENT

Months 1 through 6

A. Find and equip office.

B. Hire staff.

C. Implement immediate cost savings proposals at an estimated yearly savings of $1,183,324.

D. Form a standing committee of representatives of the 10 largest telecom users for the purpose of formulating a comprehensive, 10-year statewide voice and data telecommunications plan.

E. Assemble a data base of all agency telecom cost and formulate a tracking system for such expenses.

F. Seek out and retain the services of telecommunications consultatants in the fields of voice and data integration, video teleconferencing, and digital transmission facility construction.

Months 6 through 12

A. Prepare a 10-year comprehensive state and agency wide telecom plan that will accomplish the following:

1. Substantially reduce expenditures in the area of telecommunications for all state and local governments.

2. Provide for statewide, state owned and operated digital highway for transmission and integration of voice and data.

3. Complete construction of satellite based emergency communications system.

4. Provide for a comprehensive system to monitor and track communication expenses for all state agencies.
5. Provide for the technical expertise to evaluate and integrate State-of-the-Art technology into the state's network in a timely fashion.
6. Formulate telecommunications policy for the agencies that will ensure the interconnectivity of all systems and equipment purchased for use by state agencies.

DRAFT NOTES

1. Estimated savings of T1 Digital Carrier over present group channel:

	Present	N.Y. TEL T1	Mo.Savings
Syracuse - Utica	$ 19,654	$ 4,843	$14,811
Syracuse - Watertown	14,159	5,760	8,399
Syracuse - Rochester	18,425	4,540	13,885
Syracuse - Binghamton	17,192	4,232	12,960
NYC. - Hauppauge	14,625	6,479	8,146
TOTALS	$ 84,055	$ 25,854	$58,201

(Yr. $698,412)

2. Estimated Savings by replacing LINCS circuits within the 518 LATA with IntraLATA WATS 234,912 (see attachment 1).
3. Replace WATS calling from Albany to Washington D.C. and N.Y.C. to Washington D.C. with ITT Foreign Exchange Service - estimated savings $250,000 per year.
4. Competitive bid all long distance circuits. Estimated savings - 20-30%.
5. Pay for all telecommunications purchases through a bond issue or capital expenditure. Savings of millions of dollars in interest cost.
6. Reterminate Tie Lines and off-premise extensions in the Rochester area into the Rochester SOB instead of long hauling into Buffalo.
   Do the same into Poughkeepsie instead of long haul to Albany.

7. Off load Albany to White Plains, Albany to Mineola, and Albany to Ronkonkama FY Groups onto Eastern Microwave (EMI) bring this traffic into N.Y.C. on EMI and complete via IntraLATA WATS.

8. VIDEO TEXT - with no or low transmission cost, Video Text becomes a wide spread reality.

9. VIDEO TELECONFERENCE -

   A. SUNY and Medical Centers

      1. Share professors and medical specialists throughout the SUNY system via teleconferencing.

   B. All State Agencies

      1. Reduce transportation and lodging cost.

      2. Make more efficient use of executive's time.

10. Reducing or eliminating transmission cost for data users CREATES a new and dramatic opportunity for sharing vast amounts of data located throughout the State.

   A. College and high school students with personal computers (PC) or terminals with "after hours" unlimited access to State owned transmission system sharing geographically dispersed data bases.

11. Elimination of long lead times to install private lines. It presently takes from 4 to 6 months to get a private line from AT&T With a State owned system, this time could be cut to 2 or 3 weeks.

12. By allowing local governments to access a State owned system millions of dollars in transmission costs could be saved.

ANNEX B

NEW YORK
TELECOMMUNICATION STUDIES

TELECOMMUNICATIONS

IN

NEW YORK STATE

BACKGROUND AND EDUCATIONAL CAPACITIES

APRIL 1985

BY

Gregory M. Benson, Jr.
Carol Anne Stiglmeier
and
Peter F. Stoll

NEW YORK STATE EDUCATION DEPARTMENT
CENTER FOR LEARNING TECHNOLOGIES

Introduction

The fundamental "infrastructure", which underlies the evolution of New York State from a manufacturing and industrial state to one that is high-technology and "information-based", is telecommunications or the electronic highways across which many vital services are streaming. Together, transportation systems and electronic highways represent the basic transport capacities, or infrastructures, for delivery of goods and services in society. As this evolution into an information-based society occurs, the dependence on electronic highways will increase dramatically. Indeed, the present quality of education, health care, government productivity, and the competitive advantage of New York businesses are heavily reliant upon electronic highways for delivery, diagnosis, research, production, inventory, sales and financial transactions vital to economic health. This dependence will increase over the next several years and requires comprehensive planning if New York is to remain the Empire State.

New York State has enjoyed a long history of leadership in education, economic development, government, recreation, and culture. The state has retained a competitive edge in these endeavors because of careful planning and well coordinated actions among the public sectors.

At present, New York State faces the impact of major increases in the costs of providing current telecommunications services at a time when many of the State's existing communications networks are becoming outdated, ineffective, and unreliable. As these telecommunications problems are addressed, it is vital to recognize that New York State will retain a leadership role in the nation only by planning for future telecommunications needs through a well-coordinated strategy. Plans must be forumlated that focus on network sharing, resource coupling, and coordination of applications and services.

Other states who have faced telecommunications problems similar to New York, such as Ohio, Arizona, Kentucky, and California, have embarked upon the planning of a statewide communications network coordinated through a centralized office. This planning ensures the maximum cost-effective use of communications resources and the elimination of redundant and underutilized systems. California's plan for telecommunications very closely approximates the needs and conditions of New York State. Therefore, a review of some of the salient features of that plan is worth noting here.

The California Experience

California's public sector, prior to the development of its plan, was spending in 1983 upwards of $1 billion a year for telephone service, data transmission, and other telecommunications systems. Projections indicated that costs would double within a year due to the current restructuring of the Nation's telecommunications industry. California wished to curb these costs and to discover ways to use telecommunications more effectively for increased productivity.

California projected several scenarios for telecommunications applications in 1990 for each of the institutions comprising the public sector. Each scenario consisted of an assessment of extant telecommunications capacities and an estimate of growth. A review of these scenarios clearly shows that institutions have common telecommunications needs and must be aggregated for the purpose of achieving cost reduction and enhanced quality of services. In short, coupling extant capacities to meet applications universal to all of the institutions represents the only effective strategy for approaching statewide telecommunications planning in an efficient and cost-effective manner.

California Elementary and Secondary Education Sector Projections

Cable/ITFS for 1990:

- Cable will be the most used delivery system for television services to the schools. Twenty percent of all cable systems will carry voice and data in addition to video. The number of Instructional Television Fixed Service (ITFS) systems will not increase, but will expand to a wide range of intercommunication possibilities. Sixty percent of schools will have access to videotex services.

Computers:

- There will be a microcomputer for every 50 children. Seventy percent of schools will participate in an electronic data network and 40% of pupil records will be held in electronic form. Seventy-five percent of schools will have access to videodisc players.

Energy:

- Twenty-five percent of schools will have installed a telecommunications-based energy management system which will result in 30% energy cost savings.

Travel:

- Twenty-five percent of travel will be replaced by teleconferencing and electronic mail, resulting in $7.5 million saved.

Mail:

- Electronic message services will replace a third of present non-parcel mail, resulting in a $2 million plus yearly savings.

California Higher Education Sector Projections for 1990

Office Automation/Mail:

- Word processors will replace 50% of secretarial typewriters. Electronic mail will account for 50% of intra-campus mail, 20% of first class mail, and replace 25% of informational phone calls.

Video:

- All campuses will own or lease independent telephone systems, and internal transmission systems will have broad band capability for voice, data, and video transmission.

- Statewide video, voice, and data requirements of higher education will be pooled into one transmission system.

- Two to three full time video circuits will be available for shared use. Off-campus education will be accomplished by transmitting one of the above video circuits via direct broadcast satellite and through a complex of ITFS systems, low power television stations, and cable systems.

Energy:

- Thirty percent savings in energy costs will be realized through telecommunications systems.

Travel:

- Twenty percent of routine administrative intra-State travel will be replaced by teleconferences.

California Public Broadcasting Sector Projections for 1990

- Conventional broadcasting will remain the mainstay of programming, but stations will build their future on brokering technological and service bases, by developing alliances with cable, and making use of ITFS, FM sub-channels, and low power television for the transmission of voice, video, and data.

California Public Library Sector Projections for 1990

Office Automation:

- Seventy-five percent of all records will be machine readable and housed in a statewide on-line database. All libraries will have access to multiple bibliographic utilities.

Mail:

- Electronic mail will replace 75% of non-parcel mail.

Video:

- Videotex services will be available to 60% of the state population; 30% of the libraries will have satellite receival equipment.

Computers:

- Fifty percent of libraries will lend computer hardware/software; 60% will use videodisc storage technologies.

California Public Museum Sector Projections for 1990

- Museum telecommunications development will be tied to an association with other public institutions, such as education, libraries, and local government.

- Museums will use cable TV for dissemination of services and video disc technologies for cataloging and sharing programs and collections.

Clearly, the use of telecommunications systems for the delivery of voice, video, and data can be applied to the needs of all educational and cultural institutions. Institutions will reduce costs associated with energy, mail, travel and communications through the integration of telecommunications.

California's Public Telecommunications Project reviewed the implications for statewide planning of a telecommunications system in light of the above scenarios as well as health, emergency communications and other State services. It was of vital importance, as reflected in their final recommendations, to plan across institutional sectors by identifying mutual needs of extant telecommunications systems which could be "coupled" for greater cost-savings. California's final recommendations emphasize the need for greater cost-savings and for following a coordinated planning approach to developing a shared state communications system.

The three key California Study recommendations are:

- That the state public sectors jointly develop a telecommunications system based on shared local switching systems interconnected via a system of hubs and broadband communication links. The system would provide voice, video and data services.

- That the State establish an Information Technology Administration agency to ensure coordination across public sectors in the development of telecommunications policies.

- That the State create a non-profit, quasi-governmental entity to implement the new system and ensure coordinated and economical planning and operation.

New York Telecommunications Studies

Several studies have already been conducted in New York State that address the need to improve the state's telecommunications infrastructure and administration of services. During the administration of Governor Carey, investigation of New York State's management of telecommunications was prompted by the divestiture and deregulation of the Bell System, the explosive development of new technology, the anticipated soaring cost increases for telecommunications systems and services, and the demand for increased services for both public and private enterprises.

Recognizing the consequences of failing to take positive action to respond to these issues, the Carey administration recommended the creation of a single centralized and unified telecommunications office to provide long range telecommunications planning and policy development, to efficiently provide vitally needed services, and to control and contain the spiraling cost of telecommunications services for the State of New York.

Within the last year, several reports have been issued which underscore the economic and social importance of an efficient and effective telecommunications infrastructure in New York State.

The New York State Council on Fiscal and Economic Priorities issued a report citing New York State's economy as one that is more dependent on telecommunications than that of any other state because of the concentration of corporate world headquarters, financial markets, international and commercial banking, insurance, and broadcasting. The report issued by the State Council entitled Telecommunications Policy: Opportunities for New York State recommends that State government policy be updated and developed to:

- maintain technological neutrality
- support a flexible regulatory model
- strive for cost-based pricing
- foster entry of new carriers and services into New York State's markets
- maintain essential services
- accept marketplace failure

The Council on Fiscal and Economic Priorities recommended a three part agenda:

1) The formulation of the Governor's Office of Telecommunications Policy to develop these policies, review State and federal regulatory decisions and proceedings, make known the State's position, maintain and update policies, survey the effect of decisions and proceedings on the economic and social well-being of

New York State, and improve the State's own telecommunications infrastructure.

2) The creation of an administrative and regulatory reform agenda, and

3) The development of a New York State "Digital Thruway".

In September 1984, Lieutenant Governor Alfred Del Bello issued a report citing serious weaknesses in the State's system for emergency communications. This report includes the summary of testimony presented at hearings in early 1984 by State and local emergency service representatives. Testimony by these officials provides a comprehensive assessment of the status of emergency communications in New York State and, though testimony differed somewhat, there was unanimous agreement that all emergency services share two major problems:

- An over reliance on commercial telephone lines
- The absence of effective, reliable interagency communications.

The Lieutenant Governor recommended that:

1. the problem be elevated to the highest level of State government;

2. the Governor appoint an interagency task force to address and make recommendations to remedy the widespread existing deficiencies in State and local emergency communications;

3. an improved telecommunications system should form the backbone of the State's emergency management network and be designed to permit subsequent usage by other state agencies and by county and local emergency management officers;

4. strong consideration be given to placing the centralized management of such a system in the Governor's office headed by a Director of Emergency Communications;

5. counties centralize their emergency communications (the principal benefit associated with centralization is greater interagency communication, one of the two major deficiencies cited in this report).

Further research by staff of the Lieutenant Governor's office yielded information that supports these recommendations. For example, a review of the telecommunications networks of only 8 agencies revealed that these networks lie virtually parallel and represent significant redundancy.

These networks are:

- New York State Lottery
- New York Network (Public Broadcasting)
- New York State Thruway
- OGS LINCS
- Research Foundation
- Safety Emergency Management Organization (SEMONET)
- SUNYNET (Backbone)
- SUNYNET (Tributaries)

In consultation with the executive staff of telecommunications corporations it was suggested to the Lieutenant Governor's staff that New York State charge itself with the ability to plan, control and manage telecommunications resources in such a way as to produce a cost effective transfer of information for all State Agencies. In this way, all Agencies will be able to share, rather than duplicate, the necessary information transfer media for the various applications of each Agency. This recommendation reflects the California experience. Further consultation with telecommunications experts (AT&T) suggested the possibility of a $1 - $4 million immediate savings by the creation and operation of an Office of State Communications Management that addresses comprehensive planning and market aggregation.

The culminating work of the Lieutenant Governor's Office urged that an Office be created within the State Executive Department to centralize, unify, plan, prepare and implement a comprehensive cost-effective communications network in order to effectuate a coordinated system for interstate and intrastate agency communications for use by the State of New York and its localities.

Further illustration of the emergent need to address the telecommunications issue as a major State priority is embodied in the series of reports resulting from the hearings and symposiums conducted by the New York State Legislative Commission on Rural Resources. Inherent to nearly all of those reports, which cover all aspects of state services, is the underlying "enabling" contribution that well planned, cost-effective telecommunications can afford for enhanced economic development and improved delivery of vital services in rural areas.

The Symposium (February 7-8, 1985) held earlier this year by the Commission on Rural Resources included the development of recommendations to address the needs in a variety of key government service areas. In the area of education, the policy group recommended that on a rural, regional basis, the variety of educational and cultural organizations join with other community-based organizations to specifically address a comprehensive approach to planning for technological and telecommunications applications.

As is witnessed by the deliberations of the Commission on Rural Resources and the other important efforts noted above, there is a pervasive realization that the application of telecommunications requires planning and involvement across a variety of New York State's

public institutions if the State is to achieve the benefits of the highest quality system for a reasonable cost.

Within the educational and cultural community, the New York State Education Department has already explored the implications of public telecommunications, especially broadcast technologies, to assess the adequacy of services they currently provide. The study and report, Telecommunications in New York State, was supported by the National Telecommunications and Information Agency (NTIA) and specifically defined geographical areas where access was currently available and deduced areas of the State that did not have access.

In addition to defining areas of coverage, the report recommended that existing services be enhanced and new telecommunications technologies be adopted for program delivery to areas of the State which did not receive programming. Specifically, the project studied:

- the coverage patterns and related demographic studies of open-circuit television, public radio, television translators and the forerunners to low power television;
- closed circuit technologies, cable television systems and Instructional Television Fixed Services (ITFS);
- the ramifications of nontransmission technologies which supplement traditional broadcast technologies (i.e., videotape, videodisc and computers); and
- the development of plans for enhancing public telecommunications services.

As a result of this study, the Education Department submitted this year a proposal to NTIA to expand the public television capacity to uncovered areas of the State.

Federal Telecommunications Initiatives

Action is also being taken on telecommunications policy and administration at the federal level. On October 30, 1984, President Reagan signed into law the Cable Communications Policy Act of 1984 (Public Law 98-549). Among the many actions which resulted from this law was the establishment of the Telecommunications Policy Study Commission. This Commission is charged with:

1) Comparing various domestic telecommunications policies of the United States and other Nations, including the impact of all such policies on the regulation of interstate and foreign commerce, and

2) Preparing and transmitting a written report thereon to the Congress, the President, and the Federal Communications Commission.

The Education Department has established contact with this Commission in order to closely track their findings and the implications for New York State.

Other action by the Federal Government involves a change in telecommunications program emphasis by the General Services Administration (GSA). For more than 50 years, the GSA has had the responsibility of direct voice and data communications services to government agencies in the continental United States, Alaska, Hawaii, Puerto Rico and the Virgin Islands. The new program addresses issues which emerged as a result of AT&T divestiture, deregulation and new technologies. The new program emphases are:

- more efficient transfer of data;
- increased use of databases and downloading of software and data to work stations;
- the multiplicity of voice and data services and use of new telecommunications equipment (switches, information transport modes);
- increased compatibility of hardware;
- assistance with transition to new staff roles for facility management, telecommunications management and office management;
- more attention to the information needs of agencies for voice, data and video capabilities;
- the assurance that all telecommunications systems of the government properly mesh at the appropriate levels and that these systems are governed by appropriate standards to ensure proper interface and use of equipment;
- the assurance of appropriate response by the federal government to national security, emergency preparedness and continuity of government;
- the maintenance of privacy and security as systems become more cohesive;
- the assurance that market leverage is maximized to obtain telecommunications products and services.

As is evidenced by the State and Federal initiatives mentioned thus far, it becomes clear that the dependence on electronic highways will increase dramatically as New York evolves more deeply into an information-based society. Though the New York studies and reports cited above have accurately assessed telecommunications issues and capacities, they have failed to forge an initiative that blends the differing interests to achieve a coordinated strategy for the development of a comprehensive communications management structure within New York State.

It is not coincidental that states such as California, where comprehensive, cross-state agency telecommunications planning has already occurred, also hold the seed beds of a changing and growing society that depends so heavily on telecommunications.

As New York moves toward the realization of the economic and social implications of the "information age", state government must

take bold leadership to create a system to provide enhanced capability for serving the vital needs of the citizens of New York State and to create a more attractive environment for business by providing cost-effective, shared public/private telecommunications capacity for educational and cultural opportunities as well as other vital services.

Telecommunications and New York State Educational and Cultural Programs

The findings of California and the New York State reports confirm that the planning and implementation of a New York State telecommunications system must be addressed at the highest level of government from a perspective that looks across a host of vital state agency services. However, the primary concerns of educators reside with effectively forging a telecommunications system capable of interactive voice, video and data transmission to better serve educational and cultural institutions and their growing constituency demands. There are a myriad of applications and extant capacities within New York State's educational and cultural programs. The demands on these current telecommunications applications are increasing at an astounding rate and must be addressed at once.

Comprehensive assessment and planning within the educational sector is needed in New York consistent with what was undertaken in California. Though planning must be done in the context of a broader effort, the educational needs of New York State must be addressed immediately since telecommunications provides enhanced learning opportunities at significant cost reductions.

The growing role of information as a commodity and crucial resource for economic development, the need to provide greater access to learning opportunities at all levels in response to enhanced academic requirements and retraining needs, and the need to provide rural areas and special populations with equitable educational and cultural opportunities are all placing severe stress on current delivery systems.

The following review provides an indication of the extent, complexity, and probable redundancy of capacity operable in support of educational and cultural programs in New York State.

Public and School Library Programs

The rapid technological advances and benefits of networked telecommunications capacities hold significant implications for all educational and cultural institutions. However, the State's system of public and school libraries represent institutions that have a long history of sophisticated applications of telecommunications to better serve the adults and students at all levels of learning in New York. Many of the 7700 public libraries are already networked and are linked with external automated information services. Also, many of the 750 school library systems have begun to network with each other, with BOCES, and with New York State Regional Library Systems for enhanced

services and greater cost reduction. These library applications represent one of the most extensive areas of need for well planned telecommunications capacity in New York and one that will surely grow geometrically over the coming years.

New York State's system of libraries, organized around 22 regions, holds a variety of applications which require cost-effective telecommunications capacity. The Reference and Research Library Resources Systems are regional associations of libraries in colleges, universities, public library systems and special libraries (both in corporate, and not-for-profit organizations). Since the basic goal of these Reference and Research Systems is the sharing of resources to meet the information needs of the library user, students, faculty of higher education institutions, and the general public, it is imperative that cross-institutional telecommunications be further developed to support these services.

A major backbone of current automated support for New York State's library system is the New York State Interlibrary Loan (NYSILL) program. In addition to processing and tracking requests through the library system, the NYSILL telecommunications network provides an interface with the Regional Medical Library (RML) network and the Metropolitan Inter-Library Cooperative System (MILCS). Furthermore, a fast-growing NYSILL microcomputer network provides numerous sites with online access to the State Library's online, automated catalog.

Another backbone computer/telecommunications system serving libraries is the Online Computer Library Center (OCLC). This shared bibliographic system offers a variety of library and information service, which are used heavily by 236 school libraries, academic libraries, and the public library systems. The SUNY Central Administration Office provides supporting network services and staff training.

In addition to the above library telecommunications networks, the Research Libraries Information Network (RLIN), which includes four of the largest research libraries, and the Health Information Library Services program, consisting of ten resource libraries as area service centers, all have direct access to the NYSILL telecommunications systems and the New York State Library's automated online catalog through microcomputer terminals.

In the health area alone, the telecommunications traffic is substantial and in 1982/83 these libraries received and processed nearly 65,000 interlibrary loan requests for health information. The State Library System's telecommunications networks played a vital role in fulfilling this health information service and, as the above data indicates, when one views the State's library system across all of its network components, the current and future telecommunication traffic is enormous and growing at an unprecedented rate.

In addition to telecommunications traffic internal to the library system, the recent (1978) effort to create Regional Networks for Intersystem Cooperation has resulted in a number of pilot efforts which

extend library resource sharing, through telecommunications, to include instructional institutions in the K-12 (public schools and BOCES) and postsecondary areas.

The array of vital services provided through the public library network and the substantial traffic these networks generate are all dependent upon a well planned system of telecommunications in New York. This need is clearly recognized in the "Library Service Long Range Program Statement" issued in 1984. In that document, the Education Department put forth a plan to establish direction for future statewide technological and telecommunications development to assure efficient use of resources, enhance quality of services, and increase access to library information. In pursuit of that plan, the Education Department is currently:

- Seeking legislation and funds for a research and engineering study to plan and design the telecommunications component of a coordinated, statewide, resource-sharing and document delivery system.

- Seeking legislation and funds to set standards and guidelines to ensure the compatibility of publically funded automated systems.

- Developing telecommunications access to statewide bibliographic locator files which include both monographs and serials.

- Providing libraries of all types with online access to data bases.

- Developing and encouraging telecommunications links to all national networks serving libraries in New York State.

This brief review of but <u>one program within the educational and cultural enterprise</u> in New York State illustrates the complexity and cross-institutional needs of our telecommunications applications and underscores the urgency of addressing that need in New York State.

<u>Public Broadcasting System</u>

New York State currently has a rich array of broadcast capacities. The State Education Department, in 1982, received a major research grant from the National Telecommunications and Information Agency (NTIA) to study the current status of public telecommunications in New York State. As mentioned earlier, the study provided exhaustive data on public television/public radio coverage, translators, cable systems, video disc capacity, and reception and playback capability. The current "scenario" of public broadcasting capacity in New York State shows many of the same trends as those described in California's report.

Public Television

All of the twelve public radio stations funded by New York State enjoy satellite "downlink" communications services. National Public Radio (NPR), which serves these stations with satellite programming, makes transponder time available to education entities to meet ad hoc communications needs.

Instructional Television Fixed Service (ITFS)

New York State in the 1960's was the leader in the country in acquiring and putting on the air ITFS stations. Lack of funding forced a number of these stations to go "black" and cease broadcasting. However, there still remains a network operated by three Catholic dioceses (New York, Brooklyn-Queens, and Rockeville Centre in Nassau-Suffolk), which covers the state with four channel video/audio capacity, sub-carrier FM capacity, vertical blanking interval capacity for teletext and/or videotex, from Montauk on Long Island over to Staten Island and up to Kingston. The network, which has interconnect capability between the three major arms of the service, currently serves nearly 450 schools in 14 downstate counties.

Low Power Television Stations (LPTV)

Over the past 15 years the public broadcasting stations and the thirteen Southern Tier counties that fall within the Appalachian Region have installed some 116 translators. Nearly all of these translators are still operating. Because the State Education Department requested interrupt rights on all of the 100 translators it was involved in installing, the Federal Communications Commission (FCC) was influenced to ammend its regulations and allow all translators the status of "low power television stations" (LPTV). This meant that corporations and school districts held licenses to over 100 potential low power television stations which could either repeat programming received from satellites and/or other broadcasting stations, or originate programming to meet specific local information needs. These potential LPTV stations extend the telecommunications capacity of the State, have implications for FM subsidary communications authorization (SCA) use, videotex and teletext, and have the potential of broadcasting both analog and digital information.

Teleconferences

New York State, through both the public television community and the activities of the Center for Learning Technologies, uses teleconferencing as effectively as any other state, with the possible exception of Alaska. The State Education Department has produced a total of 17 one hour, live teleconferences in the last two years.

The combined networks represented by public broadcasting, public radio, ITFS, and low power television stations provides a variety of

existing and potential services to all New York State educational and cultural institutions. Some of these are as follows:

- Download video and interactive computer programs to libraries, small businesses, schools, hospitals, and other centers of community activity for job training and development of career skills.

- Provide programming materials through home or community center receive sites which address the specific educational and economic needs of women, minorities and handicapped persons to assure ability to participate equitably in society.

- Supply public affairs and cultural programming to isolated audiences.

- Enable the State Education Department and other relevant state agencies to reach the rural areas of the state with teleconferences, information and job training programs.

- Supply, where possible, feeds to LPTV, ITFS, VBI, SCA services, and narrowcasting services.

- Following certain Canadian and Alaskan "distance learning" models, aggregate audiences for the cost-effective distribution of materials and instruction that would otherwise be economically prohibitive to distribute.

- Deliver materials to upgrade community services such as health care, ambulance Emergency Medical Technician (EMT) training, and other medical services.

- Provide post-secondary education materials such as the Annenberg/CPB Telecourses currently in development, and similar materials to enhance the opportunity for higher education.

- Deliver state government information to help close the information gap between rural and urban communities and encourage more enlightened participation in both state and local government.

- Allow participation by New York State and the State Education Department in helping meet regional and national educational needs.

- Allow the State Education Department to make available its library of video resource materials to all schools, educational institutions and their students without prejudice of distance and isolation.

Surely any development of a telecommunications system to serve our educational and cultural programs must take into account the vast capacities described that are resident with, or complementary to, our public broadcasting system.

Post Secondary Education

The postsecondary education system in New York State is heavily reliant upon telecommunications for administrative purposes. Recent work by SUNY Central Administration illustrates the need to significantly enhance this capacity beyond the administrative applications to include video, voice and data networking capabilities to 64 SUNY campuses and community colleges. The pressure of decreased fiscal resources requires a more cost-effective approach that allows for sharing of computing, video and instructional resources.

Recent investigations have led to the issuance of a "Request for Information" (RFI) by the SUNY Central Administration to create a "SUNYNET" to serve the diverse telecommunications applications of this public postsecondary system. Basic to the intent of this RFI is the desire to increase cross-institutional capacity and include links to other educational and cultural programs such as the public broadcasting system, public schools and libraries.

The planning and development of SUNYNET holds significant implications for improving telecommunications capacities in the public library and elementary and secondary programs. The close proximity of the SUNY campuses to other educational and cultural institutions will allow for effective resource sharing and development of programs at the postsecondary level that will directly support the enhanced requirements of the Board of Regents Action Plan to Improve Elementary and Secondary Education Results in New York. The use of interactive telecommunications to share postsecondary instructional capabilities with secondary schools in subject areas such as mathematics, science, technical fields and foreign languages, would contribute substantially to the local school's capability to address new Regents curriculum requirements. Inter-institutional coordination can also foster greater articulation of instructional programs across a life long learning continuum and provide access to computing facilities on a shared basis for basic and continuing educational purposes.

As SUNYNET expands and evolves, it and other postsecondary networks must be viewed as a major telecommunications component within the mosaic of educational and cultural telecommunications capacities.

The recent (February, 1985) announcement that the National Science Foundation is funding four nationwide supercomputer centers in the United States has significant implications for telecommunications planning in this arena. A Center will be established at Cornell University's Center for Theory and Simulation in Science and Engineering. A supercomputer center will be established at the John Von Newmann Center for Scientific Computing in Princeton, New Jersey. This center is made up of a 12-member Consortium of Scientific Computing (CSC). New York University and the University of Rochester are members of this Consortium. (Other centers will be located in San Diego, California and Champaigne - Urbana, Illinois.) The sharing of supercomputer resources with other academic and research institutions will be an important consideration if New York institutions are to maintain leadership in the technical and other research areas. Aside

from these supercomputer initiatives, sharing existing computing facilities among the research centers will also enhance research capacity and investment potential.

This rich postsecondary potential for mutually beneficial telecommunications sharing across educational and cultural programs is another component that cannot be overlooked.

Elementary and Secondary Education

The Board of Regents Action Plan to Improve Elementary and Secondary Education Results in New York has placed increasing demands upon the educational community because of the new curriculum requirements outlined in that Plan. Schools are now faced with the very difficult task of providing increased instruction in foreign languages, mathematics and science. The option of six and one half units of credit available for independent study will increase the number of students participating in individual learning experiences at home, in local public libraries, in local community and four-year colleges and universities. Furthermore, the increase in corporate training programs offering credit will place a greater burden upon traditional schools to provide programs related directly to future occupations. These trends not only have implications for the reorganization of the traditional learning environment, but also for telecommunications planning since more learning will occur beyond the school setting. Telecommunications systems will link schools to these new learning environments and thereby dramatically increase the learning opportunities.

In order for educational institutions to provide high quality learning experiences they must maintain a competitive edge in a marketplace of diverse learning options. The Regents will continue to underscore the need to ensure that learning opportunities be available in an equitable fashion to all students, in rural and urban areas equally, to the homebound, the economically disadvantaged, the disabled, and the handicapped.

Many schools who are facing declining enrollments are not able to offer a comprehensive curriculum to students and envision telecommunications technologies as a means of offering a strengthened curriculum to students with equity and access for all. Administrators are exploring the use of these technologies as an alternative to school consolidation, transporting students from one learning site to another and as a means of meeting the new requirements outlined in the Regents Action Plan.

Microwave broadcast systems, fiber-optics, coaxial cable, leased-lines and combinations of these technologies are being applied in ways that cross traditional school boundaries, connecting schools with other learning sites within and without their district, with other states and other nations. Voice, video, data, and graphics capabilities are inherent to these systems.

In addition to the above curriculum applications there are several [illegible]istrative and instructional applications that can be provided [illegible]ugh cost effective and efficient telecommunications systems. The [illegible]rtment's current efforts in this area - New York State School [illegible]ter Services System (NYSSCS) and Comprehensive Instructional [illegible]gement System (CIMS), will be described later in this review.

A 1983 survey of 10,000 educational institutions in New York State [illegible]he use of computers (of which 83% replied) revealed that almost [illegible]0 microcomputers were being used by approximately 600,000 students [illegible]6,000 teachers. At that time, there was an indication of the need [illegible]lectronic networking. The survey revealed that more than 4,000 [illegible]nals were networked and being used by more than 103,000 students [illegible],500 teachers. The demand for networking capabilities has grown [illegible]that survey was taken and recent data (Fall, 1984) indicates that [illegible] schools (excluding BOCES) now have over 56,000 microcomputers, [illegible] minicomputers, and over 700 mainframes. Also, at the time of the [illegible]nal survey, 75% of the usage was for instructional purposes. The [illegible]d for systems that can accomplish a host of administrative and [illegible]room management applications has grown since 1983. Specific [illegible]tions of computer applications were documented by the survey. [illegible] functions include network access, testing, information [illegible]mination, electronic newsletters, collection management (online [illegible]ry resources), grade reporting, attendance, scheduling, payroll, [illegible]nt historical information, and word processing. Data was also [illegible]red on the number of schools that were subscribing to electronic [illegible]rmation networks from the commercial sector.

This data and other qualitative data indicates that a [illegible]ehensive telecommunications network can greatly enhance the [illegible]ams and services offered by educational and cultural institutions [illegible]ew York State. For example, the New York State Education [illegible]rtment's proposal for a statewide computer system was recently [illegible]d by the legislature for $1.1 million. This funding would [illegible]lish pilot sites to put in place State communications standards [illegible]rotocols, which would make it possible for all local school [illegible]icts and BOCES to benefit from the existence of a [illegible]ommunications system. It is anticipated that the standards and [illegible]cols that will be tested through two sites should provide the [illegible]wing benefits:

- Document and data interchange between the Department and a variety of services in the BOCES and school districts. This capability will allow for electronic mail and electronic curriculum dissemination.

- A data dictionary specifying definitions of data which will be part of the State system and which will enable districts to meet their reporting requirements electronically.

- Capability to exchange instructional software and authoring systems from district to district across the State. This instructional software includes support for direct

instruction to pupils as well as inservice training to teachers and administrators.

- Delivery of instructional services resident on computers in different locations around the State. For example, courseware in Suffolk County could be used by students in the Buffalo City Schools and vice versa.

In addition to the funding of the pilot projects to help develop communications standards and protocols for eventual incorporation in a statewide network, the State Education Department will continue to seek funding to explore effective alternatives for establishing a Statewide data communications system. This project and subsequent proposals are closely articulated with those in the library and postsecondary sectors in order to promote the resource sharing so vital to achieving the mutual objectives of New York's educational and cultural institutions.

The current elementary and secondary system through which this will be implemented is the New York State School Computer Services System (NYSSCSS) which consists of 13 BOCES regional computer centers and focuses on online interactive processing of administration functions.

A related paper developed by District Superintendents of Schools and Staff of the Office of ESC Planning and Support Services entitled Future Directions for the Delivery of Computer - Based Management Services to School Districts in New York State consists of four major components:

- perceptions of School District Administrators and teachers toward computer-based systems (including telecommunications)
- critical assumptions underlying future plans
- a projective statement regarding computer-based capabilities required by school districts in the future, and
- modes of delivering computer capability vis a vis a transition from online utilization to on site computers operating in conjunction with large systems as integrated databases.

Telecommmunications systems will play a vital role in the evolutionary development of integrated multifunctional systems such as those envisioned in the above paper.

Computers are also being applied to enhance instructional efficiency through the Comprehensive Instructional Management System (CIMS). CIMS is a management system designed to support teachers in the classroom, measure the progress of each student, identify the strengths and weaknesses of each student, and provide the student with a sound foundation in basic skills, mathematical concepts, and concrete strategies for integrating listening, speaking, reading and writing skills.

As indicated above, one important application of telecommunications technologies is providing programs such as CIMS and NYSSCCSS in a cost-effective and equitable manner. Quoting from the Department proposal, a telecommunications network can:

- Assure accurate and timely data to State Agencies (State Education Department, Legislature and the Governor) relative to school finance, pupils and staff.

- Reduce the paperwork burden on schools through computer-based support.

- Assure that schools use information from the computer-based system to more effectively manage their instructional and administrative affairs and to deliver instruction in the most efficient and effective manner.

- Integrate the planning, development and use of technological systems in both instructional and administrative areas through a common system architecture with different layers of compatible hardware/software.

- Minimize redundant effort and cost at all levels (State, regional and local) in the collection and use of data and the planning, development and application of technological systems.

- Insure against incompatible or rapidly obsolete technological solutions.

In the area of instruction, important applications of interactive video, audio, and/or graphic capabilities are also being explored by a number of schools and BOCES as is evidenced by the following projects:

Westchester County - Eight school districts in this area of New York State have a common cable television system and are studying the feasibility of using cable technology as a method of offering courses that are not available to some of the school districts as a means for addressing the "Regents Action Plan".

St. Lawrence-Lewis Counties BOCES - The BOCES is coordinating development of a microwave broadcast system which allows two-way audio and video signals among three school districts in this "north country" area. Subjects to be taught include Spanish French, Latin, AP English, Psychology, and several business related courses.

Delaware-Chenango-Madison-Otsego BOCES - The BOCES is coordinating the establishment of communications technology labs in five school districts, among which instruction will be transmitted using voice, data and graphics communications systems.

Chautauqua County BOCES - Staff at the BOCES are coordinating a pilot test, using two-way audio and video cable technology to transmit instruction from a remote location in a school to a classroom in the same school. Staff will compare the use of telecommunications in teaching to teaching in the traditional classroom.

Houghton College - A microwave broadcast system allowing two-way audio and video signals between the main campus of Houghton College in Houghton, New York, and the Buffalo Suburban Campus of the college in West Seneca, New York, is currently being used for instructional delivery and for administrative communications. The West Seneca Campus is able to offer its first baccalaureate program by "beaming" instruction from the main campus in Houghton to the campus in West Seneca.

In addition to the above, many more school districts, BOCES, library systems and post-secondary institutions are initiating the comprehensive planning required to establish telecommunications networks to support instructional programs and services.

The needs generated by the "Regents Action Plan" hold significant implications for increasing telecommunications capacities. The management of administrative and instructional data needs to be expanded and the application of interactive video, audio and graphics will play a growing role as an instructional medium to extend learning opportunities.

The extant capacities in the area of elementary and secondary education must be carefully assessed in light of the capacities previously mentioned in the other educational and cultural areas since many hold potential for complementing and meeting the needs in this important area. For instance, extant public broadcasting capacities hold significant implications for the "distance education" system of telecommunications. Also, the public library systems have a vital role to serve in instructional resource sharing across elementary and secondary institutions. The possibility of applying "distance education" capacities to include postsecondary institutions also holds implications for faculty sharing to help local schools address enhanced requirements in math, science, and foreign languages.

The potential for extending and merging resources from a variety of educational and cultural programs to focus on critical needs in elementary and secondary education is great. The capacity of a well planned telecommunications system that takes into account various extant capacities and growing applications can move educators in New York State toward a rational approach to meet that challenge.

As is illustrated by this review of telecommunications applications within the State's educational enterprise, the issues are extremely complex. Careful, comprehensive planning in light of current and projected needs is essential. Such planning must take into account the various applications discussed and orchestrate them as a dynamic

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system able to address the diverse range of lifelong learning opportunities represented across educational and cultural programs.

Summary Statement

The planning of effective telecommunications systems that build upon existing capacities and address enchanced and more equitable services for New York State's citizens is undoubtedly one of the most important and complex issues to face over the coming years. When viewed from a broad State perspective that grows from a desire to share resources and meaningfully integrate vital State services, the task is of enormous proportions. To shrink from this crucial challenge is frought with social and economic liabilities that cannot be afforded.

AUTOMATION MANAGEMENT

Electronic Highways:

The New Roads Needed for Excellence in the Empire State

by Gregory M. Benson, Jr.

MUCH HAS been written about the promises and pitfalls inherent in the profound changes being encountered and brought about by the information revolution." This revolution is characterized by explosive developments in electronic information technologies and their evolution into complex telecommunications systems that span the globe.

From a technology perspective, this evolution is hallmarked by the merging of *computing* and *telecommunications* capacities into a technical configuration referred to in the French technology literature as "compunications."

The analysis of the social and economic implications and requires a dynamic approach equal to that which characterizes the revolutionary potential and explosive nature of the technological developments themselves. Government must not only keep pace, but project and positively plan.

The fundamental "infrastructure" which underlies our evolution from a manufacturing and industrial society to one that is high-technology and "information-based," is telecommunications or the electronic highways across which many more vital services are streaming. Together, our transportation system and electronic highways represent the only basic transport facilities for all goods and services in our society. As we evolve more deeply into an information-based society, the dependence on electronic highways will increase dramatically. The present quality of education, health care, government productivity, and the competitive advantage of New York businesses is heavily reliant upon electronic highways for delivery, diagnosis, research, production, inventory, sales and financial transactions vital to economic health. This dependence will increase over the next several years and requires comprehensive planning that transcends political and programmatic interests.

For the vital role telecommunications has and will have increasingingly in the future, the "defacto policy" for its planning and implementation (similar to that outlined by Rod Monger of Fordham University in the November, 1984 *Empire State Report* series on "automation in government") leaves us precariously exposed, and at risk of losing a social and competitve advantage.

Action must be the mandate for a specific organizational entity, preferably, one that transcends all of those in existence today. In another era, it was that model embodied by the New York State Thruway Authority that went beyond geo-political and program interests to address the broader and vital economic service delivery and access needs of the state. The situation today with the need for electronic highways is analgous and fortunately without the liabilities and pain caused to land owners and businesses who suffered the hard decisions of thruway pavement dissection of treasured properties or redistribution of revenue generating traffic. Deliberations of a "New York State Telecommunications Authority" would probably find when state needs were aggregated across all agencies, that satellite technology would be very cost-effective and appropriate. The billions of voice, video and data bits streaking to and from New York State locations will only invisibily dissect outer space and not require personal or environmental sacrifice inherent to a variety of other transmission alternatives.

The New York State Thruway model also provides for shared public/private financing which is an approach worthy of exploration. Consider the cost of thruway travel if only public agency vehicles traveled its length. Those concrete ideas that yielded a workable public/private consumer base, sharing the cost based on usage and nature of the traffic hold significant implications for the telecommunications dilemma today.

The "defacto telecommunications policy" is an expensive luxury. It allows programs in any of a variety of state agencies to plan single application telecommunications network capacities and thus spend millions of our state dollars without the comprehensive assessment of available capacities or benefit of the guidance of a master electronic highway plan and the market leverage it provides through the aggregation of state traffic. The current *de facto* tunnel vision approach could lead to microwave towers on all of our high peaks and leased lines in a solid mass of redundant capacity representing the "success" of thousands of the state's program directors "solving" their "unique" telecommunications problems.

It is not coincidental that states such as California, where comprehensive, cross-state-agency telecommunications planning have already occurred, also hold the seed beds of

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a changing and growing society that depend so heavily on telecommunications. Moreover, such comprehensive planning takes into account the need for organized, high quality telecommunications that serve areas off the "high density" traffic paths.

The State of California issued a report in 1983 on the status of public sector telecommunications. For many reasons the telecommunications issue was addressed from the executive branch and looked across all government agencies. One of the most valuable elements in the California report was the breakout of current telecommunications costs incurred by the state. For example, it was estimated that with the implementation of a statewide public telecommunications system of sufficient capacity and sophistication, the state could achieve a 30% savings in energy costs by 1990, *more than $2,000,000 annually* in current postal charges, and as *much as a 40% cut in telephone costs.*

As our dependence on telecommunications increases, we must resolve the dilemma outlined in a recent staff paper prepared by the Council for Fiscal and Economic Priorities which states:

"As we prepare to formulate a telecommunications policy, we must note the irony of a revolution predicated upon information that is so poorly understood. This lack of understanding is the product of three failures.

"The failure to understand the underlying technologies and their capacity to reshape our economic and social fabric. Technology has a power that either we can harness by an intelligent realignment of our regulatory structure or we can waste and distort by ignoring or attempting to rereverse or retard clear economic imperatives.

"The failure to take a long-term view of the opportunities and problems posed by telecommunications. The working assumption of many observers is that the current near-term conflicts between residential and business users of telecommunications services will continue in perpetuity. This assumption is not supported by the economics of the emerging technologies.

"The failure of our leadership to face the telecommunications issue. What is, indeed, a difficult transition from a regulated to a mixed market is being made all the more difficult by the general lack of support for necessary reforms of the cost, pricing and delivery of telecommunications services. Public fear and confusion have been all the worse because our leaders and public institutions have joined, instead of directing, the chorus."

A distressing indication of the state's telecommunications dilemma was recently underscored in a *Times-Union* news article (October 21, 1984) in which Mr. Donald DeVito, Director of the State's Emergency Management Organization, indicated that "the state's emergency communications system is held together with chewing gum and bailing wire".

Let us briefly review the rich telecommunications resources available to orchestrate in achieving our objectives.

The "highways" or telecommunications transport mediums in use in New York include cable, statellite, fiber optics, land lines, microwave, low-power television, public radio and television and cellular radio. Widescale use of the laser is also probably close at hand.

Of these means of transmission, radio and television are mentioned because of the increased use of FM subsidiary communications authorizations (SCA) and the television vertical blanking interval (VBI) for voice and date transmission. The SCA and VBI technologies allow for extremely low-cost voice and data transmission using the airwaves as opposed to many other mediums which require far more initial capital outlay, maintenance costs and usage fees. Though this technology is not new and not bidirectional, the implications for speeding the "broadcast" communications of government and business are significant and the cost-savings enormous.

In support of New York's educational enterprise, explorations are underway to use the FM/SCA for downloading instructional software to remote homes, schools, and libraries whose other constituents might not otherwise have access to these learning opportunities.

Mutual Broadcasting System is using this FM/SCA to keep decentralized sales personnel of the Amway Corporation up-to-date on new products with regular data and voice broadcasts that are captured automatically if the sales staff are in the field.

These lesser known mediums (FM/SCA and VBI) are but a sampling of possible applications and mentioned to illustrate that extremely low-cost telecommunications capacities exist if we were to imaginatively apply them. The state's system of public radio and television provides a ready-made network for implementing such capacities if carefully planned as part of a mosiac of transmission capacities serving the telecommunications needs in New York State.

The applications or "traffic" which is flowing across these electronic highways is as varied as all of our public and private agencies. However, some are worthy of mention for their direct bearing on our state's social and economic goals.

Teleconferences are in widescale use in both government and business to enable a far wider audience involvement while reducing travel costs. Though not equal to the benefits of a face to face meeting, the teleconference has a clear role as an application of promise.

Videotext is a two-way video capac-

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that displays information for the ...ver on demand in response to ...enu" selections made at a keypad ...ched to a television. The Urban ...velopment Corporation is devel... a pilot of this application to ...ide wider access to government ...rmation. However, the widescale ... of this application will be depend... upon a comprehensive telecom...nications network that provides ...ess to the information for citi... in Pieseco, Millbrook and Swan ...e as readily as Albany and New ...k City.

Educational opportunities using ...eractive computer learning tech...logies and two-way audio/video ...e growing substantially and will be...me commonplace as new stand...ds demand instructional delivery ...o remote communities without the ...ources to hire qualified teachers ...d as independent home study for ...h school and postsecondary credit ...ows in popularity.

Online database research services ...o support business, health, educa...tion, and agriculture are critical to ...e achievement of excellence. These ...lectronic libraries must be linked ...across communities and institutions ...o insure equitable access. In a soci...ty where information is power, lack ...of telecommunications planning lim...its those who can share in its exer...cise and the resultant economic ...advantages.

Medical diagnostic services and ...health care information are far more ...accessible in the high-density areas. ...However, in the second largest rural ...state in America, we cannot ignore ...telecommunications systems to equi...tably distribute these vital services.

Financial services are becoming ...increasingly automated for the bank...ing, brokerage and other money vend...ing institutions. The lack of well-...planned telecommunications will ...exclude many communities from ...these services on a cost-effective ...basis. Such exclusion will inhibit loca...tion of financial institutions which ...will decrease small business devel...opment or expansion of existing firms.

This review of but a few applica...tions reliant on telecommunications ...makes it clear that we must elevate ...telecommunications to the highest level in New York State for immedi...ate and comprehensive planning and implementation.

The key objectives are, as they have been, for the Empire State for some time: social and economic excellence, equitable access, and increased productivity—all pursued in the most cost-efficient manner.

The situation is complex and requires a solution-oriented effort to match. The extent of policy and organizational considerations relative to addressing telecommunications are vast. They are an integral part of the evolution our entire society is undergoing. The laws and policies derived from an industrial era that are still guiding institutional behavior today must be reviewed for their consistency with today's problems.

As New York moves toward the realization of the economic and social implications of the "information age," the state government should take bold leadership to create a system of "electronic highways" to: provide enhanced capability for serving the citizen's vital needs; create a more attractive environment for business by providing cost-effective shared public/private telecommunications capacity for educational and cultural opportunities; and provide global order entry and inventory control, and make available access to the state's growing commercial information and data services.

Leadership at the Governor's level in the development of a rational and cost-effective telecommunications plan would surely encounter political and adminsitrative resistance from existing programs, agencies and commissions. The Governor's role should transcend such limited perspectives to be responsive to the need for comprehensive, deliberate planning of the state's telecommunications applications.

The element of risk relative to the bold leadership required will be judged as high. An indecisive, diffused approach could accrue far greater economic, social, and human liabilities. New York cannot afford to be adrift in the technological and competitive currents of this new age without a well-charted course and strong hands at the helm. ■

A YEAR FOR RESULTS

(Continued from Page 25)

arbiter of what would be good for individuals. I'm not optimistic [about repeal]. As long as the governor supports the seatbelt bill and key leaders do, it will stand. But the issue should be aired again."

The bottom line, though, keeps coming up anyway: Can Cuomo and the Legislature continue the good working relationship that so far has been the hallmark of the governor's tenure?

"I think he's been enormously cooperative with the Legislature," said Assembly Speaker Stanley Fink, D-Brooklyn. "We've all worked well."

Cuomo already has taken steps to try to maintain that relationship. During his State of the State address, he frequently singled out Democratic and Republican legislative leaders for praise. And in his year-end interviews for the Capitol press corps, he said he couldn't have accomplished what he did without the full participation of the Republican-controlled Senate and Democratic-controlled Assembly.

"You don't achieve legislation as a governor," Cuomo said. "You achieve legislation as a system. The role of the governor is to lead in such a way that you create the synergism that allows these forces to come together, or persuades them to come together. That's what I intend by use of the word, 'family.'"

Nevertheless, legislators of both parties expect this session to be more of a family feud.

"I suspect that with the gubernatorial election coming up, you will see some lively political interplay between the Republican Senate and the combination of the Democratic Assembly and the governor's office," Zimmer said.

"I'm hopeful that the Senate Republicans and the Assembly Republicans will continue to provide our own agenda and that we exhibit leadership," Nozzolio said. "The governor has not really been challenged enough on these policy questions. I'm hopeful the majority in the Senate, working with us, will be able to put forth better alternatives and be more aggressive in showing the public those alternatives." ■

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ANNEX C

LETTER OF SUPPORT

FROM

AT&T

AT&T Communications

L.J. Monaco
District Sales Manager

Room 101
1215 Western Avenue
Albany, N Y 12203
Phone (518) 459-6430

January 28, 1985

Mr. A. H. Turner
Emergency Communications Manager
Office of the Lieutenant Governor
State Capitol
Albany, New York 12224

Dear Alan:

The attached paper has my thoughts on why New York State should centralize its planning, control and management of telecommunications.

I tried not to get into the underlying technological changes that are making centralization, from a customer point of view, possible.

Should it become necessary for an in-depth discussion or expansion of this subject don't hesitate to call on me or my staff.

Lou

LJM/nn

Attachment

Memorandum For File

RE: Centralized Planning, Control and Management of New York State Government Communications Requirements.

Background

Until recently network architecture was important only to telecommunications industry engineers. This was because network signalling and interfaces were self-contained and transparent to the customer. The Bell System evolution of its network, both the transmission systems and central office switching components, were influenced by the theories of "Economies of Scale". These influences produced a cost effective network, which today meets the communications challenge. Evolution in the world of telecommunications has now brought us the capability to transmit signalling, control and call management across networks and between customer locations through a set of standard interfaces.

The technology of communication is rapidly merging with those of the computer. Technology is bridging the last remaining gaps to link together transmission systems, switching processors and intelligent customer premise equipment. Language is becoming digital and intelligence is software controlled. Technology is viewed as a means to satisfy user needs by continuing to provide more flexibility, more functionality and better price performance.

Problem

New York State Government communications needs are ever changing when viewed through the size and potential growth of interexchange expenditures. These communications expenditures continue to be a major resource to be managed within any state government.

AT&T estimates of future telecommunications requirements indicate there will be continued growth and expansion of the resource and its importance to the State. Estimates of that composite growth (voice, data, teleconferencing, etc.) are approximately 6% annually through 1990. The need for information transfer to service the citizens of New York State, during the period 1985-1990, will cause specific services such as data transmission to grow approximately 16% each year.

In order to effectively plan for the State's future communications needs, the Government should begin to take advantage of things like "Economies of Scale", state of the art technology and the concept of sharing networks.

The State, through its many Agencies, requires varied sizes and lengths of communication media to carry out its mission for the people of New York. Using current planning and managing methods would make the cost of these communications services prohibitive in the future. What is required is the ability to plan, control and manage the telecommunications resource in such a way as to produce a very cost-effective transfer of information for all Agencies. As mentioned earlier the technology is evolving to a digital software controlled environment. This will now permit Agencies to share rather than duplicate the necessary information transfer media for the many differring applications.

Problem (cont'd)

This will also produce timely functionality under customer control with ever improving price performance.

Summary

There are four key requirements of a communications service. The first of these measures is connectivity. Simply stated, it means having the type of service you need, where and when you need it. The second parameter is functionality which includes the management and control capabilities necessary to tailor services to meet specific applications. Performance is a measure of overall quality of communications services. Examples include transmission accuracy as measured by bit error rate, voice quality, timeliness of provisioning, restoration and reliability. The fourth parameter is value. This is a measure of the cost-effectiveness as compared to other communications and non-communications alternatives.

In the rapidly changing technological environment, where every communications decision is multi-faceted, one should strongly consider lease over purchase ownership to guarantee continued management support and the evolution of technology into the future with minimal investment.

Centralization of the Planning, Control and Management of New York State Government communications requirements will insure that Agency requirements are met without loss of relative autonomy; take into account price performance; provide digital transmission, which along with software control will drastically reduce implementation intervals; and will provide professional network management.

ANNEX D

ACTUAL BILL

(COST OF COMMUNICATIONS)

REVISED

OFFICE OF GENERAL SERVICES
DIVISION OF TELECOMMUNICATIONS
QUARTERLY REPORT OF EXPENDITURES

FISCAL YEAR 1984-85

QUARTER Second

ACCOUNT & LOCATION	EQUIPMENT RENTAL	TOLLS	MESSAGE UNITS	OTHER CHARGES AND CREDITS	TOTAL CHARGES
457-2000 - Albany	828,146.87	62,727.02	134,900.29	329,729.80	1,355,503.98
474-2121 - Albany	2,261,130.49	291,150.22	267,017.35	324,857.01	3,144,155.07
488-4141 - Manhattan WTC	712,375.22	107,088.84	121,999.17	229,158.50	1,170,621.73
847-3131 - Buffalo	280,367.83	34,392.25	23,060.39	22,982.73	360,803.20
428-4000 - Syracuse	212,468.97	13,472.46	14,154.65	233,063.90	473,159.98
793-2200 - Utica	57,622.41	11,479.54	6,264.27	6,481.99	81,848.21
773-7700 - Binghamton	77,119.56	4,584.51	5,376.92	2,447.36	89,528.35
782-0100 - Watertown	40,320.69	5,666.67	0.00	7,623.79	53,611.15
678-2323 - Harlem	59,590.74	16,711.41	11,730.79	1,707.20	89,740.14
360-6700 - Suffolk	23,758.57	6,428.20	32,139.60	1,314.35	63,640.72
587-4000 - Manhattan West	304,163.67	59,517.36	55,335.24	50,853.11	469,869.38
431-5700 - Poughkeepsie	4,162.65	3,396.66	2,498.45	608.19	10,665.95
219-4100 - Broome St.	15,329.16	5,409.74	7,298.37	171.50	28,208.77
270-4800 - Troy	553.48	26.18	0.00	2,558.84	3,138.50
TOTALS	$4,877,110.31	$622,051.06	$681,775.49	$1,213,558.27	$7,394,495.13

RL LEASE - 98,000/MO
RL MAINT - 448,000/YR.

OFFICE OF GENERAL SERVICES
DIVISION OF TELECOMMUNICATIONS

Quarterly Report
of
Intercity Expenditures
Fiscal Year 1984-1985
First Quarter

Category of Charge	April 1984	May 1984	June 1984	Total
A. Shared Network ITS				
1. FX Line Charge	($ -136,003.62cr)	-----	($ -45,468.32cr)	($ -181,471.94cr)
2. FX Message Unit	-----	-----	-----	-----
3. FX Tolls	-----	-----	-----	-----
4. RR Line Charge	575,420.58	$ 117,737.17	121,741.30	814,899.05
5. RR Message Unit	79,643.10	80,921.72	79,680.72	240,245.54
6. RR Tolls	4,283.35	2,767.84	2,131.19	9,182.38
7. Group Channel Joint User	*338,167.04	*335,887.43	704,363.75	1,378,418.22
8. WAT	26,730.80	61,078.40	65,598.66 C-BAR	153,407.86
9. WAT RR	182,768.56	177,080.64	201,431.25	561,280.45
10. Trunk to Tie	1,014.81	1,015.16	1,014.81	3,044.78
11. Specials Joint User	2,243.73	1,156.82	1,083.12	4,483.67
12. Eastern Microwave	49,170.00	49,170.00	49,170.00	147,510.00
Sub-Total	$1,123,438.35	$ 826,815.18	$1,180,746.48	$3,131,000.01
B. Dedicated Circuits				
1. Group Channel	*$1,344,770.64	*$1,347,050.25	$1,357,159.02	$4,048,979.91
2. Specials	71,666.16	62,493.97	65,839.76	199,999.89
Sub-Total	$1,416,436.80	$1,409,544.22	$1,422,998.78	$4,248,979,80
Total	$2,539,875.15	$2,236,359.40	$2,603,745.26	$7,379,979.81

*See Attached Sheet

REVISED

OFFICE OF GENERAL SERVICES
DIVISION OF TELECOMMUNICATIONS
MONTHLY REPORT OF EXPENDITURES

FISCAL YEAR 1984-85

MONTH July

ACCOUNT & LOCATION	EQUIPMENT RENTAL	TOLLS	MESSAGE UNITS	OTHER CHARGES AND CREDITS	TOTAL CHARGES
457-2000 - Albany	233,951.16	20,836.05	39,382.64	264,398.57	558,568.42
474-2121 - Albany	738,612.46	99,410.94	78,607.90	222,795.52	1,139,426.82
488-4141 - Manhattan WTC	235,611.75	34,332.20	36,372.55	-3.33	306,313.17
847-3131 - Buffalo	91,770.83	10,924.20	5,411.54	13,865.88	121,972.45
428-4000 - Syracuse	69,492.89	4,617.35	935.01	6,430.73	81,475.98
793-2200 - Utica	18,701.12	3,654.09	1,476.63	1,040.29	24,872.13
773-7700 - Binghamton	25,096.55	1,407.14	1,696.01	979.15	29,178.85
782-0100 - Watertown	13,907.15	1,737.08	0.00	7,466.05	23,110.28
678-2323 - Harlem	19,042.90	5,080.59	3,939.96	1,145.80	29,209.25
360-6700 - Suffolk	7,966.69	2,245.54	9,270.31	1,292.30	20,774.84
587-4000 - Manhattan West	98,363.52	18,260.38	15,850.10	5,325.24	137,799.24
431-5700 - Poughkeepsie	1,383.17	1,040.09	583.33	96.82	3,103.41
219-4100 - Broome St.	5,109.72	1,482.77	2,004.50	236.30	8,833.29
TOTALS	$1,559,009.91	$205,028.42	$195,530.48	$525,069.32	$2,484,638.13

OFFICE OF GENERAL SERVICES
DIVISION OF TELECOMMUNICATIONS
MONTHLY REPORT OF EXPENDITURES

FISCAL YEAR 1984-85

MONTH August

ACCOUNT & LOCATION	EQUIPMENT RENTAL	TOLLS	MESSAGE UNITS	OTHER CHARGES AND CREDITS	TOTAL CHARGES
457-2000 - Albany	246,557.44	21,923.52	52,673.81	-69,971.43	251,183.34
474-2121 - Albany	742,444.47	98,370.49	104,037.14	13,207.20	958,059.30
488-4141 - Manhattan WTC	237,522.34	37,332.34	38,275.37	21,072.12	334,202.17
847-3131 - Buffalo	92,533.83	11,209.31	9,578.10	1,802.41	115,123.65
428-4000 - Syracuse	69,191.77	4,708.66	8,658.57	218,956.35	301,515.35
793-2200 - Utica	18,868.01	3,945.04	2,579.96	1,367.34	26,760.35
773-7700 - Binghamton	25,885.68	1,601.14	340.56	686.89	28,514.27
782-0100 - Watertown	13,240.74	2,065.19	0.00	217.85	15,523.78
678-2323 - Harlem	20,241.00	5,651.76	3,874.57	256.62	30,023.95
360-6700 - Suffolk	7,895.09	2,279.00	11,972.39	11.48	22,157.96
587-4000 - Manhattan West	99,728.70	20,793.92	19,343.53	24,395.96	164,262.11
431-5700 - Poughkeepsie	1,428.09	1,326.10	1,137.48	483.95	4,375.62
219-4100 - Broome St.	5,109.72	1,634.38	2,786.77	-32.40	9,498.47
TOTALS	$1,580,646.88	$212,840.85	$255,258.25	$212,454.34	$2,261,200.32

KLEVIS

OFFICE OF GENERAL SERVICES
DIVISION OF TELECOMMUNICATIONS
MONTHLY REPORT OF EXPENDITURES

FISCAL YEAR 1984-85

MONTH September

ACCOUNT & LOCATION	EQUIPMENT RENTAL	TOLLS	MESSAGE UNITS	OTHER CHARGES AND CREDITS	TOTAL CHARGES
457-2000 - Albany	347,638.27	19,967.45	42,843.84	135,302.66	545,752.22
474-2121 - Albany	780,073.56	93,368.79	84,372.31	88,854.29	1,046,668.95
488-4141 - Manhattan WTC	239,241.13	35,424.30	47,351.25	208,089.71	530,106.39
847-3131 - Buffalo	96,063.17	12,258.74	8,070.75	7,314.44	123,707.10
428-4000 - Syracuse	73,784.31	4,146.45	4,561.07	7,676.82	90,168.65
793-2200 - Utica	20,053.28	3,880.41	2,207.68	4,074.36	30,215.73
773-7700 - Binghamton	26,137.33	1,576.23	3,340.35	781.32	31,835.23
782-0100 - Watertown	13,172.80	1,864.40	0.00	-60.11	14,977.09
678-2323 - Harlem	20,306.84	5,979.06	3,916.26	304.78	30,506.94
360-6700 - Suffolk	7,896.79	1,903.66	10,896.90	10.57	20,707.92
587-4000 - Manhattan West	106,071.45	20,463.06	20,141.61	21,131.91	167,808.03
431-5700 - Poughkeepsie	1,351.39	1,030.47	777.64	27.42	3,186.92
219-4100 - Broome St.	5,109.72	2,292.59	2,507.10	-32.40	9,877.01
270-4800 - Troy	553.48	26.18	0.00	2,558.84	3,138.50
TOTALS	$1,737,453.52	$204,181.79	$230,986.76	$476,034.61	$2,648,656.68

STATE OF NEW YORK
EXECUTIVE DEPARTMENT
OFFICE OF GENERAL SERVICES
GROUP CHANNEL AGENCY DETAIL ATT CIRCUITS
NOVEMBER 1984

CODE NAME
AGENCY 596 CNTY OF ALBANY-DEPT. OF SOC. SVCS.
SUB AGENCY 000

CIRCUIT NUMBER	EFF DATE	LOCATION	EQUIPMENT CODE	QTY	CHARGE	IX MILES	IX MILEAGE CHARGE	GC MILES	GC MILEAGE CHARGE	MISC CHARGE	CIRCUIT CHARGE
A61FD308SSA	10 01 82	ALBANY	ALU	2	47.96	0	00.00	0	0.00	64.62	112.58
AGENCY TOTAL					47.96		00.00		0.00	64.62	112.58
GC TOTAL					429,879.32		31,950.91		561,840.00	2,189.12	1,025,859.35

ANNEX E

SUMMARY REPORT
ON
PUBLIC HEARINGS

SUMMARY REPORT

Public Hearings on

"Emergency Communications in New York State"

Conducted by

Lieutenant Governor Alfred B. DelBello

June 4, 1984

INTRODUCTION

This report provides a summary of testimony given at three public hearings on "Emergency Communications in New York State" held in New York City, Albany, and Buffalo and offers recommendations as to what actions must be taken by the state to address the serious deficiencies highlighted by the hearing process. These hearings were chaired by Lieutenant Governor Alfred B. DelBello in response to a request by Governor Mario M. Cuomo that he look into the lack of an effective, reliable statewide emergency communications system.

Emergency communications in New York State crosses several levels of government and involves a wide range of emergency service organizations. The testimony of state and local emergency managers at these hearings revealed a staggering number of problems, not the least being the inability of many emergency services to communicate with each other on a reliable basis.

To provide a clear picture of the magnitude of the problems outlined at these hearings, a summary of testimony provided by various state and local emergency service representatives is provided below.

STATE EMERGENCY MANAGEMENT OFFICE

The State Emergency Management Office (SEMO) is the Disaster Preparedness and Civil Defense Agency for the State. In this capacity, SEMO serves as the nerve center for statewide emergency communications for events ranging from floods and ice storms to hazardous material spills or nuclear war.

Presently, the six district offices and central headquarters comprising SEMO rely on commercial telephone lines as their primary means of communication. Serving as a backup to the telephone system is a high frequency radio network providing a single-channel, voice-only capability from Albany headquarters to the six district offices.

In testimony presented at the New York and Albany hearings, the director of SEMO offered an assessment of his agency's communications by noting that while telephone lines are adequate for daily administrative matters, they are "notoriously unreliable" and usually inoperable during an emergency. Furthermore, the director stated that the radio network backup system is "antiquated," relatively unreliable, and subject to time-of-day, month-of-year, and atmospheric conditions. Exemplifying the inadequacy of SEMO communications was a snowstorm in Buffalo where neither telephone nor radio contact could be established between the western district and Albany offices.

In addition to the deficiencies cited above, testimony pointed out that communication from the field back to the Albany or dis-

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trict offices is severely limited by range and topographic barriers. For an incident where a field response is necessary, such as a hazardous material spill, in most cases the field responder is unable to establish communication directly from the scene of the accident back to the office. In fact, the only other way to establish communication between the field and a State Emergency Management Office would be either by amateur radio or telephone. The former is subject to availability, with the latter having already been shown to be patently unreliable.

In conclusion, SEMO's Director states, "There is no comprehensive emergency management communications system currently in place within New York State, . . SEMO faces a continual frustrating and intolerable situation. The cumulative cost of human suffering, loss of life and property and of untimely and extended emergency response is too high. The time to act is now, before another devastating disaster strikes."

DISASTER PREPAREDNESS/CIVIL DEFENSE

Emergency communications at the county level is coordinated and directed through each county's respective office of disaster preparedness/civil defense and public safety or sheriff's department.

The problems most frequently cited by county disaster preparedness directors are the overreliance on commercial telephone lines and the inability to communicate on a reliable basis with adjacent counties or the State Emergency Management Office.

As noted by the Chairperson of the New York State Disaster Preparedness Directors, local emergency operation centers in most areas of the state can only communicate with State Emergency Management offices by telephone. In addition, the primary means of communication for a radiological emergency at any of the state's five nuclear power plants is by dedicated telephone lines.

Local directors repeatedly stressed in their testimony the total unacceptability and danger associated with the almost complete dependence on telephone lines for alerting key emergency personnel and subsequent interagency communication during the emergency management phase. Hurricane Agnes and Mount St. Helens were just two of the numerous instances referred to where telephone lines were rendered completely inoperable during an emergency. Time and again local emergency directors testified that in a serious disaster they are unable to communicate with adjacent counties or the state. In fact, at this time, in the event of a major disaster or emergency, the Radio Amateur Communications Emergency Services (RACES), a volunteer organization, provides in most cases the only reliable means of communicating from county to county and between counties and the state.

(2) Several County directors expressed serious concern that they do not possess the tools necessary to effectuate their responsibilities as emergency managers. The need for a statewide master plan for emergency communications was strongly supported by the directors.

STATE POLICE

Public safety communications in New York is comprised of state, county, and local police agencies. Within this public safety community, there is great diversity in the level and complexity of emergency communications systems.

As is the case with SEMO, the New York State Police communications systems are heavily reliant on telephone-company-provided leased line facilities. In addition, the State Police operate a limited number of microwave point-to-point communications circuits as an alternative to telephone lines.

Two essential problems were outlined by the State Police in their testimony. A major concern of the State Police, stemming from their heavy dependence on commercial telephone lines, is the ever-decreasing level of telephone circuit maintenance and the inability of the phone company to complete repairs expeditiously. An example given to illustrate this problem involved a situation where a telephone cable failure upstate took out not only State Police radio circuits but also the "800" number used for public access into the State Police Regional Dispatch Center securing a three-county area. An excessive period of time was required to restore service, and in the interim the telephone company was unable to redirect public access telephone circuits due to lack of personnel. The State Police representative characterized this problem as "dangerous to the protection of life and property,

since law-enforcement agencies absolutely depend on their communications circuits" and stated that this type of recurring problem only reinforces the essential need for independent public safety communications systems.

A second major concern cited was the inability of the State Police to routinely communicate on fire, medical, or public works emergency channels whether at the state or local level. The capability to communicate with local police agencies is being developed but at present broad coverage throughout the State has been limited by budgetary constraints.

In conclusion, the State Police testified that a statewide communications network that provides for the needs of local area, intercounty, regional, and statewide communications circuits is essential for public safety agencies.

SHERIFF AND LOCAL POLICE DEPARTMENTS

The adequacy of county and local law-enforcement agency communications systems was most pointedly summarized in the following testimony provided by the New York State Sheriffs' Association: "It can be said that there are today in the State of New York no public safety systems geared for the 1980s or beyond."

In testimony given by numerous sheriffs and police chiefs, the problems resulting from poor emergency communications were graphically illustrated. The problems cited were almost entirely a result of the inability of public safety agencies to communicate

within their own organizations or with other police agencies.

The potential for grave consequences resulting from deficiencies in local emergency communications was addressed in testimony presented by the Buffalo City Police Department. On December 27, 1983, a gas explosion rocked downtown Buffalo resulting in seven fatalities. During the time of this disaster, the Buffalo City Police Department was faced with the impossible task of sending and receiving all radio transmissions on the same frequency used for regular dispatching. On the night of the explosion and for several days thereafter, emergency personnel were unable to communicate directly with one another, but had to follow a circuitous route. The Buffalo Police Department representative said that such an operation could not be "remotely characterized as 20th-century technology."

The strong requirement for and present lack of adequate emergency communications was testified to by police chiefs representing communities located within the emergency planning zone surrounding the Indian Point nuclear power plants. The chiefs stated that if a serious accident were to occur, they would be unable to communicate with each other in order to coordinate the evacuation of residents. One chief noted that, absent effective emergency communications, such an evacuation would be "sheer madness."

Another problem highlighted by public safety officials is the need for greater attention to long-term system design along with funding of communications. Also seen as necessary was the pro-

vision of a state consultant to advise local police agencies on the relative merits of new equipment. Police representatives said that currently they had to rely on private communications company vendors for their information and could not be assured of objective advice.

There was unanimous support from all public safety representatives for continuation of the new state-administered Mobile Radio District (MRD) program. This program is designed to provide police agencies with the capability for intraagency as well as interagency communications.

Support was also voiced for a statewide emergency communications master plan and establishment of an Emergency Communication Advisory Council. In addition, it was suggested that the New York State Law Enforcement Telecommunication Committee (NYSLETC), made up of representatives from state, local and county police departments, be conferred with official status by the State and be given a greater role in planning for a statewide emergency communications system.

FIRE

In New York State, fire emergency response is handled almost exclusively by local fire departments. Lowband radio frequencies provide the primary means of communication for these departments, with commercial telephones serving as a backup.

Testimony presented by various state and local fire officials

characterized the lowband frequencies as "outmoded" and "outdated." Fire representatives noted that the majority of problems plaguing their communications systems stem from the difficulties and limitations associated with lowband, such as weather interference and "skip" phenomenon. In recognition of this, the majority of public safety agencies are moving away from lowband radio. The FCC has encouraged this movement.

As a result of the declining use of lowband radio, the fire services are becoming isolated in the public safety community. In addition, the shift away from lowband has made it increasingly more difficult and expensive for fire departments to obtain replacement equipment as manufacturers move toward highband UHF, satellite and microwave technology. The New York State Office of Fire Prevention and Control addressed this issue by stating that "the local fire service in New York needs to start looking at some long-term approaches if it is to stay within the mainstream of the communications industry."

This sentiment was echoed by others who testified that a number of fire communications systems date from the 1950's and are under increasing strain to deal with the ever-mounting number of calls. This problem is exacerbated as fire services are being asked to respond to increasingly varied emergencies requiring rapid and reliable communication — most notably, hazardous material spills. One fire coordinator illustrated the need for improved fire communications when he related how he had to rely on the telephone

to make contact with a chemist across the state rather than being able to speak directly by radio.

In New York State a single statewide fire frequency is available for intercounty mutual aid requests. While acknowledging the usefulness of this system, fire officials testified that because of its limitations, dependable communication is possible only between adjacent counties. In addition, fire departments are at this time unable to contact the New York State Office of Fire Prevention and Control in Albany by radio. The sole means of making this connection is by telephone.

Along with the other emergency services, fire personnel strongly favored establishment of a statewide emergency communications master plan. The need for a consultant to assist in system specifications and equipment selection was also seen as vital in the effort to upgrade fire communications.

EMERGENCY MEDICAL SERVICES

Emergency medical services (EMS) in New York are made up of thousands of ambulance corps in municipalities across the state. The state agency charged with coordinating these local ambulance corps is the Bureau of Emergency Medical Services (BEMS).

Testimony provided by state and local ambulance representatives identified a number of deficiencies which combine to seriously hamper EMS communications.

In the early 1970's, New York developed a statewide EMS commu-

nications plan. The objective of this plan was to meet the communication needs of and provide coordination among all local emergency medical services.

A representative of the State BEMS noted that while most areas have EMS communications capability, "compliance with the State Plan is not mandated, and so statewide coordination is not assured."

As a result, some areas of the state are in compliance with the plan while some are not. This lack of uniformity led one testifier to comment that "New York State does not have a true EMS Communication System across the State."

In addition, it was stated that there are no funds available to provide a standardized VHF communications system in conformity with the State Plan.

In repeated testimony one of the areas of greatest concern to EMS officials is the constant interference and overcrowding on special emergency radio service frequencies (SERS) caused by non-emergency users, particularly school buses. The cause of this interference was traced to Federal Communications Commission (FCC) rules which permit school buses, veterinarians, handicapped persons and beach patrols, among others, to operate on the SERS frequency along with medical services (includes ambulances, rescue organizations, and hospitals). In densely populated areas, school buses often outnumber ambulances by more than ten to one. During school hours, such traffic can seriously impede ambulance dispatch in life-threatening situations. One ambulance representative testified

that there have been numerous delays of emergency response due to nonemergency school calls. Along with permitting nonemergency users on the SERS frequencies, FCC rules and regulations compound the problem by not requiring frequency coordination.

Another major problem testified to by EMS representatives is the lack of sufficient SERS frequencies for ambulance dispatch. One testifier characterized it as "absurd" that EMS has to share its limited radio frequencies (nine for ambulance dispatch) with nonemergency users. Unlike EMS, the police and fire services do not have to share their frequencies with other users. The absence of effective interagency radio communications was frequently referred to by EMS officials as a serious problem. The need for coordination with adjacent states was also stressed.

(4)

$ intra-state or regional coalition

Call OGS to get estimate of savings to state if telephone services were switched over to a state-owned satellite communications network.

Find out what New York State has paid in telephone bills over the last 10 years.

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CONCLUSION AND RECOMMENDATIONS

The summary of testimony presented in this report provides a comprehensive assessment of the status of emergency communications in New York State. On the basis of this testimony, it is clear that major deficiencies exist in state and local emergency communications systems. As a result of these deficiencies, emergency forces are seriously hampered in their ability to respond to and manage the call for help.

While the testimony of state and local emergency service representatives differed somewhat for each agency, there was unanimous agreement that two major problems are shared by all emergency services: an overreliance on commercial telephone lines; and the absence of effective, reliable interagency communications. Taken together, these deficiencies represent the most serious obstacles to effective emergency communications.

The question to be answered now, having summarized the hearing testimony and identified the problem, is what actions can -- and indeed must -- be taken by the state in order to address the serious and potentially life-threatening deficiencies in state and local emergency communications systems. The following recommendations represent an action plan designed to answer this question.

Recommendations

The first step which must be taken is to elevate this problem to the highest level of state government. The diversity and complexity of this issue demands no less. It is recommended that the Governor appoint an interagency task force to address and make rec-

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ommendations to remedy the widespread existing deficiencies in state and local emergency communications./ This task force should build upon the recommendations presented in the 1983 report of the Disaster Preparedness Commission's "Emergency Communications Task Force" as well as the hearing testimony summarized in this report.

The charge for this task force should be to immediately proceed with the development and implementation of a statewide emergency communications system that is not dependent on commercial telephone lines. This system should form the backbone of the state's emergency management network and be designed to permit subsequent usage by other state agencies and by county and local emergency management offices. Wherever possible this system should be designed to build upon and utilize existing communications systems and elevate the level of interagency communications capability.

Once a comprehensive emergency communications system is installed, it is recommended that strong consideration be given to placing the centralized management of such a system in the Governor's office, headed by a Director of Emergency Communications.

It was only through the direct attention and concerted efforts of the Governor and Lieutenant Governor that the State of Kentucky was able to address its statewide emergency communications problem and develop one of the most comprehensive modern emergency communications systems in the United States.

Completion of the MRD program should be accelerated from 1987-88 to 1985-86. Delaying this program any longer will only result in a further deterioration in police communications equipment already purchased under the MRD program, some of it dating back to

the early 1970's.

The state should also push for a revision in FCC rules and regulations to provide secure emergency radio frequencies for EMS. The present sharing of frequencies with nonemergency users represents a serious impediment to the dispatch and response of emergency medical personnel. In addition, the state should lend its support to a petition before the FCC to set aside specific channels for public safety use.

Finally, the state should encourage counties to centralize their emergency communications. In counties where this has been done, the results have been extremely positive. The principal benefit associated with centralization is greater interagency communication, one of the two major deficiencies identified in this report.

The problems highlighted in this report will not disappear; rather, in time they will only worsen. Recognizing this, it is imperative that the state address these problems and move forward to meet the challenge of developing a first-class emergency communications system in New York for the 21st century.

STATE OF NEW YORK
OFFICE OF THE LIEUTENANT GOVERNOR
ALBANY 12224

FRED B. DELBELLO
LIEUTENANT GOVERNOR

December 31, 1984

MEMORANDUM

TO: Michael DelGiudice

FROM: Alan H. Turner

RE: Status of Emergency Communications Task Force

In view of Lieutenant Governor DelBello's resignation and per his conversations with me in regard to the above, I am taking the liberty of submitting to you the attached package for presentaiton to Governor Cuomo. The following information, which also has the approval of The Lieutenant Governor, will prepare you to address this vital issue.

BACKGROUND: A central obligation of government is the ability to respond swiftly and effectively in the event of natural or man-made emergencies. As pointed out recently by Lieutenant Governor Alfred DelBello, after a series of public hearings held in New York City, Albany, and Buffalo, this ability to respond swiftly and effectively to emergency situations by state and local government is severely limited by inadequate systems of communication.

During these hearings representatives from the State Emergency Management Office (SEMO), County Disaster Preparedness Directors, N.Y. State Police, local police, sheriff departments, and emergency medical personnel repeatedly pointed out that the two major problems shared by all emergency services are: an overreliance on commercial telephone lines; and the absence of effective, reliable interagency communication with one central control.

STATUS: After Lieutenant Governor Alfred B. DelBello was appointed as Chairman of the Task Force on Emergency Communications, he in turn, appointed Mr. Alan Turner as Program Manager for Emergency Communications of New York under the Office of the Lieutenant Governor.

The Program Manager has since designed, developed, engineered, and coordinated a complete two-phase program for solving the problem.

PHASE I, Part 1 is a mobile trailer with full communication equipment on board to handle all possible communication on-site problems. (This equipment has already been ordered.)

PHASE I, Part 2 is re-engineering of the Emergency Operation Center (E.O.C.) at Building #22, State Campus. (When monies released, ready to go).

PHASE I, Part 3 is a satellite program at all District Office, Building #22, and mobile unit in order to provide back-bone system for emergency communication. (Has been designed; awaiting funds).

This entire program was sent to Federal Emergency Management Agency (F.E.M.A.) for 50/50 funding, 45K which has been received, approximately 1M pending release (approval slated for January 15, 1985).

PHASE II is a complete State-owned microwave network.

This very network has been the recommendation of every appointed research committee since 1967.

The function of the microwave network will provide the "digital highway" New York State needs for efficient cost-effective communication of both voice and data.

CONCLUSION: The necessity to continue the communication program has already been demonstrated.

The control of the program must and should be maintained at the Executive level of the government.

The radio emergency network should be kept under the control of SEMO.

Investigation into statewide communication led to the discovery of out-dated and redundant systems for routine communication within the agencies of state government. The overwhelming need to centralize this network within a single management agency or commission is germane to the health and safety of the populace and the State's future ability to communicate. Secondly, it is estimated conservatively that such a centralization could save New York $60 million a year.

RECOMMENDATION: To set up a unified centralized telecommunications management organization appointed the task to plan, prepare, and implement a comprehensive cost-effective communications network with the authority to cross the divisional boundaries in order to effect a coordinated system for emergency communication within New York State.

ANNEX F

AN EXAMPLE
OF
CONCERN OF COUNTIES

STATE OF NEW YORK
EXECUTIVE DEPARTMENT
EXECUTIVE CHAMBER
STATE CAPITOL
ALBANY 12224

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COPY December 1982

Dear Robin:

Thank you for your recent letter supporting my establishment of a task force to address the issue of a Statewide emergency communications network.

Following the public hearings and task force meetings held by Lt. Governor DelBello, we discovered that we had a need not only for a Public Radio District (PRD) communications network for emergency response purpose, but also to upgrade the entire State emergency communications system. The development of the State's communications capability over the past twenty years has resulted in a large, unwieldy, ineffective and costly system. The Lt. Governor has informed me that he is developing a proposal which, it appears, can save the State millions of dollars by reconfiguring the current system and integrating microwave and satellite programs into a comprehensive network for public service. At the same time, we will achieve the emergency communications capability so vital to an effective State and local response in times of disaster.

I appreciate your offer of assistance and will count on your support as we move toward final system design and the accompanying fiscal considerations.

Our mutual objective is to save lives and to protect the property of the entire family of New York. With your help, we shall achieve this goal.

Sincerely,
MARIO M. CUOMO

Honorable Robin Schimminger
Member of the Assembly
731 Legislative Office Building
Albany, New York 12248

cc: Maj.Gen. Vito Castellano, Div. of Military & Naval Affairs
Lt. Governor Alfred DelBello

ADB
NYC Office
J. BAUMGARTEN
C. CAMERON
C. CAREY
A. COOK
Z. GORDON
D. JOHNSON
L. LAVENTHALL
D. LIPMAN
M. MOROFF
S. ROY
D. TOOLEY
E. WARRING
D. ZAMBELLI
Albany Office
J. BERGEN
J.R. DOLAN
R. FREEDMAN
C. SHORIS
D. SMITH
J. TOOLEY
A. TURNER
P. VALKENBUR
L. WEISS
White Plains Office
M. BARISH
C. RICK (1)
Special Reps.
K. BOGDAN
L. BONGIOVANNI
M. BUHMASTER
J. DEXTER
P. WEILL
R. ZIMMERMAN

ST. LAWRENCE COUNTY

OFFICE OF EMERGENCY SERVICES

Emergency Operations Center
Canton, New York 13617

Patrick D. VerSchneider
Fire/Rescue Coordinator
Telephone: Office - (315) 379-2240
Home - (315) 265-8140

December 13, 1984

FIRE CONTROL CENTER
KEE - 866 - 46:06 KC
St. Lawrence County
Sheriff's Office
Telephone: 379-2222

Al Turner, Program Manager
State Capitol
Office of Lt. Governor
Agency Bldg. 4-12th floor, Room 326
Albany, NY 12224

Dear Mr. Turner:

As I indicated in our telephone conversation today, St. Lawrence County is facing similar problems to those existing in all other counties of New York State regarding emergency communications. Presently we have a new law enforcement network (MRD), a new UHF emergency medical system, a low band fire system, a low band Civil Defense network and a VHF high band hospital network (155.340). These systems are almost entirely independent of one another and it is apparent with the amount and sophistication of radio equipment that some consolidation might be effective and cost saving.

In addition to the above the county is currently considering implementation of a 911 emergency telephone number to cover the entire county. One of the problems facing St. Lawrence County is the cost of such a system as quoted by the New York Telephone Company. This cost currently is quoted as $327,000 annually - clearly an exorbitant figure.

I have been informed that the Lt. Governor's Task Force on Emergency Communications intends to address issues similar to these as they effect all counties in New York State. Prior to attempting to find solutions to problems and to developing a communications plan for our county, it would be most helpful if we knew the direction the Task Force intends to take with regards to state-wide coordination of emergency communications. Therefore I would like to know if it would be possible for you to visit St. Lawrence County and discuss the proposed state-wide emergency communications plan with interested department heads and legislators. Currently a date in the latter half of January might be best for us. If this is agreeable with you, let me know and we could confirm by telephone.

Sincerely,

Patrick D. VerSchneider
Director

PDV:gg

WARREN J RATHKE
Fire Coordinator
(716) 439-6071

NIAGARA COUNTY
FIRE SERVICE
5526 NIAGARA ST EXT
LOCKPORT, NEW YORK 14094

TO: Lieutenant Governor Alfred B. DelBello

FROM: Warren Rathke, State Fire Coordinators' Association

DATE: December 7, 1984

SUBJECT: Emergency Communications Task Force

Having attended the December 5th Emergency Communications Task Force meeting as the local representative from the Fire Service, I would like to commend all involved on the progressive actions taken by this group.

The Fire Service supports the concept of a comprehensive emergency communications system to be used by all state and local emergency agencies.

It is with a degree of skepticism on the implementation that gives me concern. I would ask that the Fire Administrator, Francis McGarry of the Office of Fire Prevention and Control, be appointed to the Task Force. As Fire Administrator, he is responsible for the activation of the State Fire Mobilization Plan in the event of a disaster, which includes implementation of the Mutual Aid Plan. He is also a member of the Disaster Preparedness Commission. I feel Mr. McGarry is a necessary asset to this Task Force.

WR/sm

cc: Zachary Gordon
Alan Turner

ST. LAWRENCE COUNTY

OFFICE OF EMERGENCY SERVICES

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Canton, New York 13617

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Telephone: Office - (315) 379-2240
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December 13, 1984

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Sincerely,

Patrick D. VerSchneider
Director

PDV:gg

CHAUTAUQUA COUNTY
EMERGENCY MEDICAL SERVICES
COUNTY OFFICE BUILDING
MAYVILLE, NEW YORK 14757
(716) 753-4341

December 18, 1984

Mr. Alfred DelBello
Lieutenant Governor
State of New York
State Capitol
Albany, NY 12224

Dear Mr. DelBello:

Recently, through the media, we have learned of your decision to step down from the Office of Lieutenant Governor.

On behalf of the Chautauqua County EMS Council, I would like to reiterate our support for your statewide sponsored emergency communications hearings and stress the need for a continuation of your initiative in these matters by your successor.

Being from one of the more rural areas of Western, New York, we, perhaps more than others, rely most heavily on a dependable communications system for police and fire, as well as ambulance operations.

It is our hope that with your departure from office this Emergency Communications Task Force will not be forgotten.

Sincerely,

Donald Burdick

Donald Burdick
Chairman

DB:bg
cc: Jess Present
William Parment

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Cayuga County Emergency Medical Services Council

Office of Disaster Preparedness
160 Genesee St.
Auburn, N.Y. 13021

September 7, 1984

Mr. Donald R. Waldron, Chairman
Public Safety Committee
Cayuga County Legislature

Mr. David R. Shaw, Chairman
Health Committee
Cayuga County Legislature

Dear Mr. Waldron and Mr. Shaw:

The following agencies have all agreed that the legislature should appropriate funds to conduct a survey regarding the radio communications with the county.

Over the past few years, more sophisticated radio equipment and systems have been set up for use by our emergency services. With this new technology, more accurate transmission and receiving equipment is required for proper operations.

Each department within the county has experienced shortcomings and problems with their particular equipment and systems. If a survey was conducted, a collective solution to our current radio shortcomings would be possible. This would ultimately be a cost effective measure.

Examples of the current radio problems are:

County Fire Control has trouble receiving Fire Chief's on their portable radios, especially, in the Northern end of the county. Also, if a storm knocked out the Frozen Ocean Tower, it would be extremely hard if not impossible to receive the units in the Northern and Southern areas of the County.

The Sheriff's Department is experiencing reception problems in several areas of the county. Even though they have a new system in place, problems still exist.

The HEAR Radio System is used for hospital to ambulance communications. There are so many counties using the same channel, many times the messages from our county units never reach the hospital. This is vital patient information and this system also acts as a backup for the ALS Telemetry System. At the present time, we are looking to purchase the necessary equipment to add a second channel to this radio system. This would give the volunteers an alternative channel to eliminate the override problems.

The Advanced Life Support Telemetry Radio System was installed here as part of a regional EMS System. The Base Unit was designed to connect our county into the regional system. It cannot adequately cover all areas of the county. More bases are needed. This is the system used by the hospital to give drug orders and receive vital patient information from the Paramedics on ALS Units.

Our ALS System depends highly upon communications. The Advanced EMT'S are the eyes, ears, and hands of the physician in the field and they must be in constant communication with the hospital. At the present time, we have major reception problems in all areas North of the City of Auburn and in many areas West of Route 34, South of the city. Onondaga County has helped up by handling some of these messages, but they cannot cover all the areas.

The County Highway Department feels the survey would help with the development of better inter communications between agencies. Plus, a combined systems update would net better prices for new equipment. Radios have become a very integral part of their daily operations.

The County Health Department would like to install a radio system for their Environmental Division. They could use such a system in the event of an environmental emergency. A survey would help with the selection and purchasing of the proper equipment.

The Emergency Management Office currently maintains backup radio systems for all county agencies. There is some debate as to the adequacy of there backups. Definite improvements can be made in this system.

This sums up the major problems with our systems. As you can see, definite adjustments must be made to provide the coverage necessary to insure all citizens of the county receive the necessary emergency services. The original request for this survey is on a recommendation from the Communications Committee of the Cayuga County EMS Council. The Council approved the request and has further recommended this proposal to the undersigned Department Heads.

We, the Department Heads, for the Emergency Services of the County, request the legislature consider extending funding for a Systematic Radio Survey of Cayuga County. This survey would evaluate the current capabilities and make recommendations as to our needs for the present and the future. We hope you will expedite this matter, as some of our current problems need immediate attention.

For the Cayuga County EMS Council:

C. Michael Hammon

C. Michael Hammon
EMS Manager

Linda W Ward

Linda Ward
Council Chairperson

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Further Recommended By:

Cayuga County Sheriff's Department

Robert C. Sponable
Sheriff

Cayuga County Bureau of Fire

Robert A. Mare
Fire Coordinator

Cayuga County Highway Department

Michael Walsh
Superintendent

Cayuga County Health Department

* See Attached

William Catto
Public Health Director

Cayuga County Emergency Management Office

John R. Coulson
Director

CAYUGA COUNTY
HEALTH DEPARTMENT

WILLIAM L. CATTO, P.

MEMO

TO: Michael Hammon &
Linda Ward

September 10, 1984

FROM: William L. Catto

RE: Radio Communications

The Cayuga County Health Department has been requesting a radio system for our Environmental Health Division for the past several years. The first and most immediate need is an emergency radio system that would have a base station and personnel available 24 hours per day, to act as a communication center for emergencies.

In addition, it would help the service and efficiency of the Environmental Health Division to have radios available during the day to communicate with technicians in various parts of Cayuga County.

These are our needs, and they should be placed within the context of the existing or proposed county communication system.

WLC/cs
cc: David Shaw

160 GENESEE STREET, P.O. BOX 218, AUBURN NEW YORK 13021, TELEPHONE (315) 253-1404

STATE OF NEW YORK
DEPARTMENT OF STATE
ALBANY, N.Y. 12231

GAIL S SHAFFER
SECRETARY OF STATE

December 17, 1984

TO: Alan Turner

FROM: Richard Barlette

SUBJECT: Emergency Communications

Thanks for sending over the emergency communications outline of your mobile phase 1 plan. It appears as though you have touched all basis and built into the system expansion capabilities for future needs.

It is good to see that we are no longer vacillating on this most important matter of emergency communications. We in the Office of Fire Prevention and Control remain committed to assist you in your endeavors in any way we can.

Jack Przekop and State Fire Administrator McGarry would like to meet with you next week, if at all possible. Please let me know if your schedule allows.

RB/lc

Emergency communication problems noted

The major problems being experienced with the emergency communications system in Warren County reflect a statewide trend, according to a recent report.

Lt. Gov. Alfred B. DelBello has been conducting hearings across the state to determine the condition of emergency communications system. As a result, he issued a report details problems ... outdated equipment, inadequate backups and lack of coordination between agencies.

Gov. Mario M. Cuomo has appointed DelBello to head a State Interagency Task Force on Emergency Communications which began meetings this week in New York City.

In Warren County, the Chiefs and Officers Association has completed a study of the emergency communications system and concluded that it will cost $338,653 to update the system and avoid major problems in the next few years. The Board of Supervisors is currently considering the study.

system, according to the director, is antiquated, relatively unreliable and subject to time-of-day month-of-year a atmospheric condition.

The report says that during a snowstorm in Buffalo, neither telephone nor radio contact could be established between the western district and the Albany office.

Frequently officers at an event such as a hazardous waste material spill can't report back to the central office by radio.

The report says that county offices of civil defense and disaster preparedness also rely too much on commercial telephone lines, and frequently have problems communicating with adjacent counties or the State Emergency Management Office.

"The primary means of communication for a radiological emergency at any of the state's five nuclear power plants is by dedicated telephone lines," the report notes.

It says that in case of a major disaster, the volunteers of RACES (Radio Amateur Communications Emergency Services) would be the only reliable means of communication.

The State Police also are unhappy with their overdependence on telephone lines, and they cite problems with service and maintenance which could bring down important emergency lines. In

State of New York no public safety systems geared for the 1980s or beyond," testified the New York State Sheriffs' Association.

Fire departments generaly use lowband radio frequencies, which were characterized in the testimony as "outmoded" and "outdated." With other agencies moving away from these systems, fire departments are seen as becoming isolated in the public safety community.

Ambulance corps in the Emergency Medical Services (EMS) reported even more problems, including the fact that they do not have exclusive use of their radio bands. Federal Communications Commission rules permit school buses, veterinarians, handicapped persons and beach patrols, among others, to operate on the same frequency.

"In densely populated areas, school buses often outnumber ambulances by more than 10 to one. During school hours, such traffic can seriously impede ambulance dispatch in life-threatening situations," the report states.

The report recommends that the task force be formed and that it proceed with the development and implementation of a statewide emergency communications system that is not dependent on commercial telephone lines. Management of such a system should be in the governor's office, according to the report.

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Cortland Standard, Mon., Sept. 24, 1984—5

Emergency Network Proposed

ALBANY (AP) — A statewide emergency communications network is needed for state and local public safety agencies to help avert tragedies that could cost lives, Gov. Mario Cuomo said Saturday.

The governor appointed a task force headed by Lt. Gov. Alfred DelBello to draw up a proposal for such a network, which would allow police, fire, ambulance and other emergency services in different municipalities to quickly and easily communicate with each other.

DelBello held hearings last spring around the state at which state, federal and local officials testified about the weakness of the current emegency communications system.

"Communities from Erie to Suffolk County have cited life-threatening conditions due to antiquated, incompatible (communications) equipment," Cuomo said. He said current emergency communicatons facilities "seem unbelievable in these days of space shuttles and satellite communications."

DelBello said that emergency communications equipment "is only slightly more advanced than smoke signals in some parts of New York."

Cuomo: improve emergency network

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DelBello said that emergency communications equipment "is only slightly more advanced than smoke signals in some parts of New York."

Syracuse Herald American, Sunday, September 23, 1984 A13

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.ate Expected to Agree to Slash Funds for York Gun

over the weekend in preparation for the House-Senate conference.

In his letter, Mr. Weinberger said he personally conducted an "intensive review" of the Sergeant York and that "I have concluded that until further testing is finished, there should be no fiscal year 1985 procurement."

"One of the alternatives being considered is cancellation," he added.

The Army had planned by 1989 to buy 618 of the mobile guns from the Ford Aerospace and Communications Company, a California-based division of the Ford Motor Company, at an estimated price of $4.5 billion. It has already signed a $1.5 billion contract for 276 of the radar-aimed cannons, which are mounted on tank chassis and fire 40-millimeter shells.

Opposition in Congress

The Sergeant York program has met intense opposition in Congress in recent weeks. Reports by both Pentagon and Congressional auditors have found flaws in the gun's performance and the Army's accelerated program for purchasing it.

Mr. Weinberger said in his letter that the Pentagon is also "re-examining its alternatives" under the contract for 1984 production of the guns to reduce the Government's "exposure."

On Friday, the Pentagon's inspector general, Joseph H. Sherrick, told the Senate Governmental Affairs Committee that the Army had used oversimplified and misleading test results to convince Defense Department officials to go forward with the gun.

In a reply to Mr. Sherrick's findings, Under Secretary of Defense Richard D. DeLauer, who was chairman of the Pentagon committee that approved production of the gun, said the decision to proceed with the weapon was "based on the best information available at the time."

The General Accounting Office, a Congressional investigative agency, warned in successive reports dated January 1984, January 1982 and January 1983 that the Army's plans to purchase the gun were risky because of problems with the testing programs.

Test Results Criticized

Henry W. Connor, senior associate director of the accounting office's national security division, testified Friday before the Governmental Affairs Committee that the Army had omitted from the testing results important information on "safety related deficiencies" and how the testing was conducted.

He noted that the Army had planned to fire 15,600 rounds of ammunition and drive the gun 4,000 miles. Because of time limits, however, only 3,600 rounds were fired. The gun traveled less than 300 miles because of equipment failures that were not disclosed by the Army, he said.

Mr. Connor criticized the Army's strategy of testing the gun as it was being produced and said that tests this year disclosed results below the Pentagon's specifications. These deficiencies included the accuracy of the automated gun's radar-controlled aiming system, the time needed for the gun to react to an attack and its ability to hit hovering helicopters.

Another report by the accounting office, made public two weeks ago, contended that the Army had paid millions of dollars more than was necessary in its initial purchases of the gun.

The Army, in response to that report, said it disagreed with many of the auditors' findings.

State Gets 2 Plans to Speed Help in Disasters

By JAMES BROOKE

New York State officials have made two proposals to sharpen emergency responses to such disasters as tornadoes, blizzards, hurricanes, toxic spills and radiological contamination.

One proposal is to unify in a single agency the work of four state agencies that now deal with disasters. This suggestion was made in an audit of state disaster preparedness programs made public yesterday by Assemblyman Arthur J. Kremer, chairman of the Legislative Commission on Expenditure Review.

In the second proposal, a study group appointed by Governor Cuomo is recommending that a statewide emergency communications system be set up independent of commercial telephone lines.

Overlapping Authority Noted

The legislative audit found that programs to prevent, respond to and recover from disasters were divided among a welter of state commissions, offices and departments. In the case of coping with nuclear accidents, for example, the audit found "a duplication of effort" between the Office of Disaster Preparedness and the Radiological Emergency Preparedness Group.

"Both agencies," the report said, "participate in identifying potential hazards, public education and information, training, drills and exercises at the local level."

Calling for a consolidated system that would answer directly to the Governor, Assemblyman Kremer said in a statement, "Our neighboring states of Vermont, New Hampshire, Massachusetts, Connecticut, Pennsylvania and New Jersey all have a single agency to handle radiological accidents and natural disasters."

In an interview yesterday, the Long Beach, L.I., Democrat said "it would only take the act of the Governor to consolidate these offices."

The audit found that five of seven New York State counties within 10 miles of a working nuclear power plant had completed emergency response plans. The study also found that 58 percent of the state's counties had either completed or were preparing general disaster plans, which are authorized, but not required, by state law.

In fiscal 1982-83 about $12 million was spent at the local, state and Federal levels in New York on disaster prevention programs, the study said.

The audit was released one week after Governor Cuomo named Lieut. Gov. Alfred B. DelBello to head a group studying interconnection of statewide emergency telephone and radio communications. The panel was formed after public hearings were held earlier this year on the condition of emergency communications in the state.

Police, fire, ambulance and civil defense officials testified at the hearings that depending on commercial telephone lines during disasters threatened lives.

Telephone lines are "notoriously unreliable" and often fail during an emergency, said Donald A. DeVito, director of the State Emergency Management Office. Furthermore, he noted, a backup system based on amateur radio operators can be foiled by atmospheric conditions. He cited a blizzard in Buffalo that had cut off radio and telephone contact with Albany.

Mobile Communications Favored

Other officials said that ambulance dispatchers often shared frequencies with nonemergency users and that the main way of communicating in an emergency at any of the state's nuclear power plants was by telephone.

"As a result of these deficiencies, emergency forces are seriously hampered in their ability to respond to and manage the call for help," the Lieutenant Governor wrote in a conclusion to a report on the hearings.

In their first meeting last week, the task force voted to recommend that the state buy a mobile communications van. Under plans discussed by the group, such vans would eventually be bought for each of New York's seven regions, and they would be linked by a backup system of microwave towers that relayed signals by satellite.

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Former Defense C

ARLINGTON, Va., S
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Mr. Sananikone had b
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ANNEX G

NYNEX PRESS RELEASE

"SUNYNET"

NYNEX Press Release
April 23, 1985

Utica, April 29 -- State University of New York and NYNEX Business Information Systems Company today announced establishment of a Telecommunications Institute at the College of Technology at Utica/Rome and predicted it would strategically move New York State toward leadership in the rapidly expanding electronic information industry.

Richard J. Santagati, President, NYNEX Business Information Systems; SUNY Chancellor Clifton R. Wharton, Jr., and College of Technology President Peter J. Cayan revealed plans for the unique multi-million dollar industry/education cooperative venture this morning at the new Marcy Campus of the College.

In addition to offering a Bachelor's Degree Program in telecommunications and helping prepare engineering technologists and administrators for the telecommunications industry, the Institute will offer credit and non-credit courses, workshops, specialized training, summer institutes and applied research.

In conjunction with the project, NYNEX Business Information Systems will design and install an advanced private branch exchange, the Intecom Integrated Business Exchange (IBX) at the Marcy Campus to serve as an integral part of the institute's learning environment. It will integrate voice and data communications, office automation systems, security and energy management systems and afford access to closed circuit TV.

The selection of NYNEX Business Information Systems for this cooperative venture in the academic program of the State University College of Technology Telecommunications Institute followed reviews of proposals from several competitive firms.

President Santagati declared that NYNEX plans to be supportive in all aspects of the Institute.

"The benefits to both NYNEX Business Information Systems and the State University through this agreement are many in number and extend over many years," said Santagati. He added, "but the real beneficiaries in the extraordinary cooperative venture are the thousands of students from throughout New York who will attend the Telecommunications Institute at the College of Technology. For them, the Institute will be the launching pad for careers in the exciting and rewarding information age." Chancellor Wharton heralded SUNY-NYNEX cooperation as "a fine example of how a corporation can contribute expertise and technical knowledge to better serve students, the public and the State's economy." Shortly after he became Chancellor of the SUNY system seven years ago, Dr. Wharton called upon industry, government and the State's knowledge centers to "forge strong bonds" at the time when New York's growth and well-being are so heavily grounded in new technology.

NYNEX engineers and telecommunications specialists will assist in the development of course design, provide faculty for some courses, and lend expertise in testing new products and services. In the future, a NYNEX executive-on-loan may become a member of the Institute faculty or administration.

Existing research projects at the College of Technology in fiber optics, digital image processing and satellite communications will be greatly enhanced by support in testing, development and evaluation.

The College of Technology is an ideally suited location for the Telecommunications Institute because the new facility has incorporated many of the specifications necessary to install the state-of-the-art technology which a "living laboratory for telecommunications" would require. As stated by a University spokesman, "At this point in the campus's development, there is flexibility to provide for the specialized needs of the joint SUNY-NYNEX commitment."

"A landmark venture of limitless promise for the future" was College of Technology President Peter Cayan's description of the Institute. "The cooperative venture between the College and NYNEX represents a commitment by higher education and industry to develop technology and human resources, not only to meet the present demands of the telecommunications revolution but to insure continuation of the evolution."

The College of Technology has become an active leader in the economic development of the Upper Mohawk Valley Region, President Cayan noted, and the Institute will help the College guide its transition from a manufacturing area to a technology-oriented economy.

"Our proposed degree program in telecommunications offers students an education available nowhere else in New York State," the President emphasized. "Because the course offerings draw from Computer Science, Engineering Technology, Business/Public Management, and Arts and Science, our graduates will be able to deal with a full range of complex problems associated with telecommunications systems."

A. Turner

REQUEST FOR INFORMATION

PLANNING, DESIGN & IMPLEMENTATION

FOR

"SUNYNET"

SHARED INFORMATION RESOURCES EDUCATIONAL NETWORK

MARCH 1985

EASTERN MICROWAVE, INC.

112 NORTHERN CONCOURSE
P.O. BOX 4872
SYRACUSE, NEW YORK 13221
315/455-5955

April 19, 1985

Mr. Donald L. Dundon
State University Plaza
P.O. Box 1946
Albany, NY 12201

Dear Mr. Dundon:

Eastern Microwave, Inc. is interested in participating in the SUNY "SUNYNET" as outlined in your March 1985 Request for Information booklet.

We presently serve SUNY on their Albany to Plattsburgh video feed. Please call me if you need any additional information on our company.

Sincerely,

Harold W. Morse
Marketing Manager

HWM:kd

RECEIVED
STATE UNIVERSITY
APR 22 1985
OFFICE FOR
CAPITAL FACILITIES

Continental Telephone Company
of New York, Inc.
850 Harrison Street Ext.
P.O. Box 609
Johnstown, NY 12095
518 762 3131
P.O. Box 205
Sanborn, NY 14132
716-693-5344

CONTEL

RECEIVED
STATE UNIVERSITY
APR 24 1985
OFFICE FOR
CAPITAL FACILITIES

April 22, 1985

State University of New York
State University Plaza
P.O. Box 1946
Albany, NY 12246
Attention: Mr. Donald L. Dundon

Dear Mr. Dundon:

In response to your letter of March 14, 1985, please be advised that in conjunction with this letter and our recent meeting regarding a Fiber Optic link across the state, that we at Contel are extremely interested in pursuing this matter further.

Our next scheduled meeting on the Fiber Optic link is scheduled for May 20, 1985 and we look forward to seeing you again as you have indicated at that time.

Looking forward to being of service to you, I remain.

Sincerely yours,

Brad Wallace
Senior Account Executive

BW/js

RECEIVED
STATE UNIVERSITY
APR 24 1985
OFFICE FOR
CAPITAL FACILITIES

Federal Electric Corporation
621 Industrial Avenue
Paramus, New Jersey 07652
Telephone (201) 967-0123

22 April 1985

State University of New York
State University Plaza
Office for Capital Facilities
Post Office Box 1946
Albany, NY 12201

Attention: Mr. Donald L. Dundon

Subject: SUNYNET - Integrated Services Digital Network (ISDN)

Dear Mr. Dundon:

Please accept this submission as our expression of interest in providing technical support services for the SUNYNET Integrated Services Digital Network (ISDN).

Federal Electric Corporation (FEC) is a wholly owned subsidiary of ITT Corporation. We are a systems/service company and affiliate to over 200 reporting ITT companies. FEC's primary business mission, over the last 32 years, has been providing Systems and Design Engineering, Systems Implementation, Technical and Scientific Services and Operation and Maintenance (O&M), for the Department of Defense, other government departments and commercial agencies for projects worldwide. We also provide base maintenance services that include complete operation and maintenance services for military installations and base camps in the United States and OCONUS.

Services provided by FEC covers the following:

- Turnkey Telecommunications Projects
- Facilities Design and construction Management
- Turnkey Communications, Tropo/Satellite Earth Stations and MW Stations
- Turnkey TV and CATV Systems

- Turnkey Air Traffic Control Systems
- Turnkey NAVAIDS and Airports
- Missile Range O&M
- Communications Network O&M
- Tactical Support Equipment O&M
- Aerospace Center Comm. & Instrumentation O&M
- Base Support/Maintenance

FEC has the manpower and resources for the development of systems engineering and specifications, implementation and acceptance testing and operation and maintenance services for the SUNYNET - ISDN.

FEC possesses a significant number of personnel assigned to our major contracts who have experience in the specific disciplines needed for the ISD Network. Resources by general type of skills are as follows:

Professionals	680
Technical and Skilled Crafts	1,080
Skilled Crafts	1,590
Operators	450
Service Logistics, Food, Etc.	350
Administrative/Clerical	550
Laborers	100
	5,000

We have provided program descriptions for several of our ongoing and former contracts. These projects required systems engineering, implementation, test and checkout operations, maintenance, calibration and repair services for installed telecommunications, and radio/communication systems, associated antennas, ancillary interface and station facilities equipment.

The following project narratives have been provided with this submission:

- Ohio Educational Television Network
- Mississippi Educational Television Network (METV)

- Pak-Arab Refinery Ltd. Microwave System
- Spanish Territorial Command Network (TCN)
- Jordanian PT&T Telephone Exchange Upgrade Program

Additionally we have provided a copy of our corporate newspaper and brochures:

- FEC NEWS #92, October, 1983 "FEC Subsidiary Awarded $16 million Ohio Telecommunications Contract"
- Brochures: O&M Around the World
  Communications for the Eighties

Should you desire additional information to that provided, please contact Mr. Ira Segalewitz, Special Projects Manager at the letterhead address or phone (201) 967-2683.

We look forward to providing technical support services that are within our business mission to the State University of New York on your future program requriements.

Very truly yours,

E L Bzdek

E. L. Bzdek
Proposal Specialist

ANNEX H

EXAMPLES OF OTHER STATES SOLUTION FOR COMMUNICATION PROBLEMS

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Microwave Network To Tower Over Ohio

By Eric R. Chabrow

By using existing microwave towers as the heart of a new data and telecommunications network, the Division of Computer and Information Systems Services within the State of Ohio's Department of Administrative Services (DAS) is developing a system that will save taxpayers some $218 million by the turn of the century.

The state is pumping $15.7 million into the project that will link 4,000 computer terminals scattered around the state to its main processors in Columbus, the state capital, and Cleveland. The countless number of telephones in state offices—which are located in all of Ohio's 88 counties—will also be linked into a single network by microwave, says Tim Steiner, the telecommunications manager who is overseeing the project.

"The primary objective of the microwave system is not to change the way users do their business," Steiner says. "There will be no changes in the investment in our [software] programs and equipment."

During the 15-year useful life of the system, which is slated for completion next year, the microwave system should reduce Ohio governmental communications costs by 53 percent, or $218.2 million, according to one state estimate.

The vast majority of microwave towers the state plans to use already exist, says Steiner, who adds that only four of the 32 towers must be built to complete the system. Twenty-two microwave towers belonging to the Ohio Educational Broadcasting Commission, which are used to link public TV stations across the state, and six towers owned by the Ohio Turnpike Commission, which line the toll road that stretches along northern Ohio, will be used, he says.

Nearly all of the microwave towers will have two dishes, providing for redundancy, Steiner says.

Using existing towers not only saves the state money but also years of possible delays that would have been caused by the need to file environmental impact studies, Steiner says. Federal law requires such studies if a new tower exceeds 300 feet in height.

"Most of the existing towers are over 300 feet tall," he says. "By using the existing towers, we didn't have to do the

Tim Steiner

study. If you remember the snail darter [the minute creature that held up a dam project in the South in the 1970s], anything can hold up a project."

Each of the four towers DAS is building will be 295-feet high, five feet shy of the height which would have required the environmental impact study, Steiner says.

Cleveland-based Ohio Bell Telephone Co. is designing circuits, with the help of the Arinc Group, Rockville, Md., to connect to the microwave network. Ohio Bell has assigned 40 engineers to the project, Steiner says.

"Ohio Bell is providing high capacity circuits to the towers," he says. "We're working well with the other [23 Ohio] phone companies, too, especially the larger ones: General Telephone of Ohio, United Telephone of Ohio and Cincinnati Bell."

The system is being built by International Telephone and Telegraph Corp.'s Federal Electric subsidiary, Paramus, N.J., which won the contract in the early 1970s to build the higher education public TV microwave system, he says.

Extensive alarm and test systems that will control the microwave network are being developed by HT and Granger Associates, Santa Clara, Calif., with a controller in each tower connected to a minicomputer at the Columbus headquarters, Steiner says.

Steiner says the state is opting for the microwave system because data use as well as the cost to transmit data using private telephone lines have been sharply climbing. "The price for private lines has doubled and our usage has tripled in the past 3-1/2 years," he says.

He projects that the state's data usage will grow by 15 percent a year while rates will increase by 5 percent, which would have resulted in higher transmission costs if the state continued to lease private lines.

With large savings in mind, the state began a study four years ago into the feasibility of using microwave transmission.

A demonstration project between 1980 and 1983, using microwave towers owned by the state's public television system, showed that microwave technology is totally acceptable for all state data users.

A key objective of the system is to meet or exceed Ohio Bell's standards for voice-band private line channels now in use.

As a totally dedicated network, many transmission impairments—such as impulse noise experienced on Bell telephone lines—will be greatly reduced.

Once the system is operational, incoming as well as outgoing long distance telephone service will be provided through the state's Centrex system. Currently, the state leases private lines for outgoing calls only.

Steiner says the microwave system, with a 1.5-Mbit transmission speed, would have sufficient capacity during off-peak hours, mostly at nights, to transmit data and files. "We'll have the advantage of not losing tapes, which causes us trouble in winter because of the cold weather," he says. "The tapes get sweaty and they can take days to dry out, if they're not ruined."

And, in the future, other electronic services could be improved using the microwave system, Steiner says.

Although not now a high priority, the communications manager says, various electronic mail services now used by a variety of state departments could be combined by microwave link through the state's mainframe computers.

DAS At A Glance

Agency Summary: The Ohio Department of Administrative Services (DAS) is the state's counterpart to the federal General Services Administration. DAS, an executive department, provides information systems, communications and other services for nearly all state agencies.

IS Summary: Tim Steiner is manager of telecommunications, which includes data communications, within the Division of Computers and Information Systems Services of the DAS. Steiner reports to DAS's deputy director, Jerry Hammett, who oversees the division. Hammett reports to department Director William Sykes, a member of Gov. Richard Celeste's cabinet. The state's main processors include two IBM 3081s and two Sperry Corp. 1100s. Forty people work within the telecommunications area. Some 300 work within the department's IS division.

Ohio Department Of Administrative Services

Flexibility Given As Reason DP&I. Users Write Own Programs

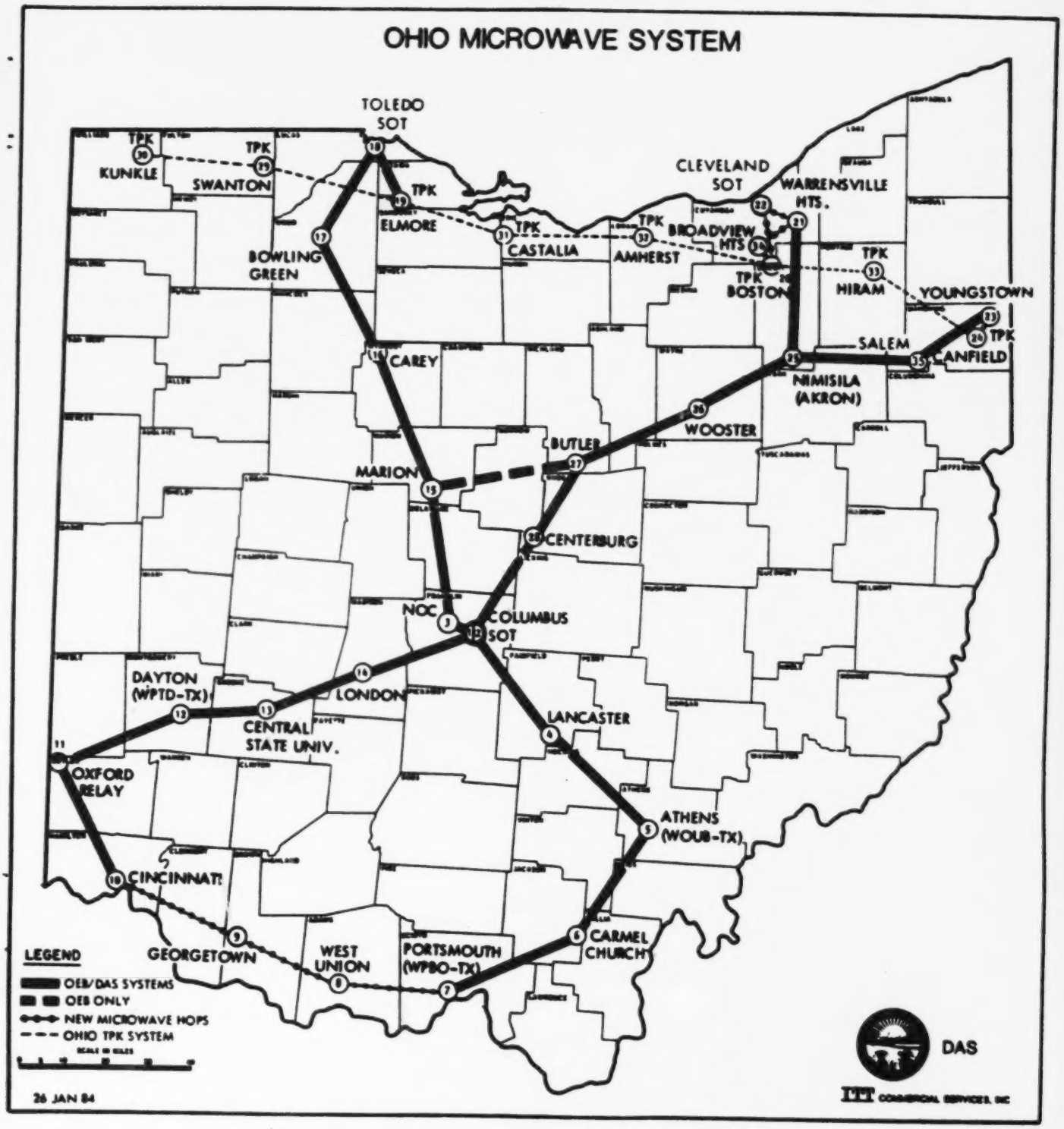
SYSTEM BRIEFING

OEB

DAS

OHIO MICROWAVE SYSTEM

ITT COMMERCIAL SERVICES, INC.



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ENHANCED SERVICES

- VIDEO TELECONFERENCING
- HIGH SPEED FACSIMILE (ELECTRONIC MAIL)
- COMPUTER - COMPUTER INTERCONNECTION
- MOBILE RADIO NETWORK
- STATE - WIDE PAGING
- DISASTER SERVICES

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4, 1982

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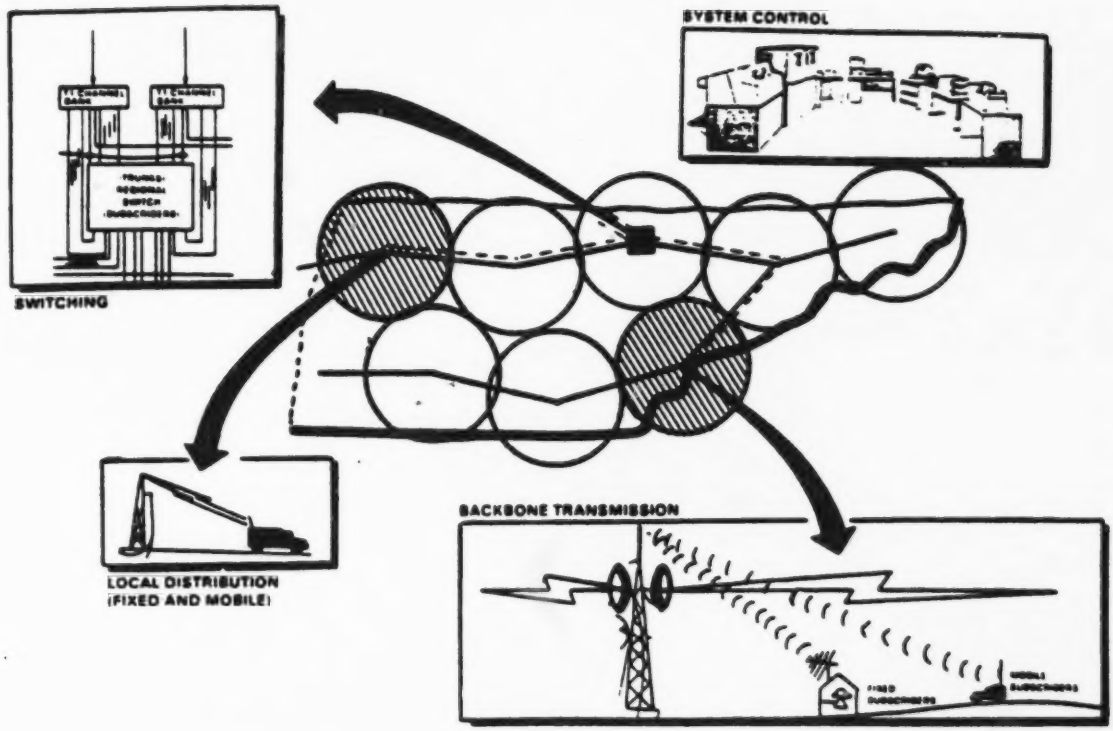


Figure I-1. Subsystems of the Emergency Communications System

OHIO EDUCATIONAL TELEVISION NETWORK

SYSTEM: Full duplex, color television to and from the Network Operations Control in Columbus, Ohio.

CUSTOMER: Ohio Educational Broadcasting Commission

APPROXIMATE VALUE: $7.3 Million

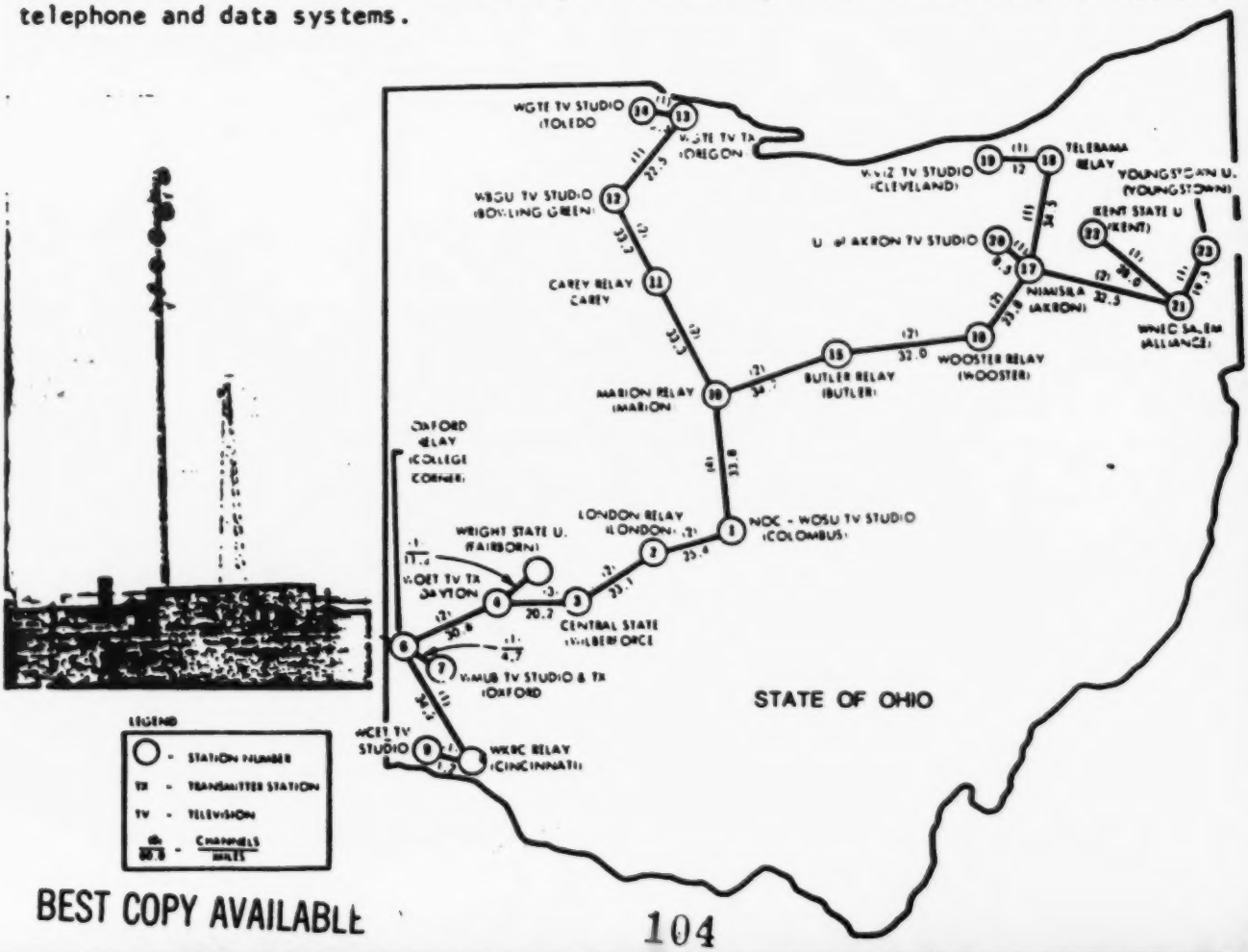
SYSTEM DESCRIPTION: No. of Sites: 23/ No. of Links: 22/ Total Path Miles: 5044 Statute Miles.

MAJOR EQUIPMENT: Microwave Radio/Television Interface Equipment/Television Translator System/Antennas/Towers/Shelterized Relay Stations/Tower Foundations/Acquisition of Real Property.

In January, 1974, Commercial Services Incorporated (CSI), a wholly owned subsidiary of Federal Electric, was awarded a contract by the Ohio Educational Broadcasting Commission to engineer, furnish and install a wideband microwave system to connect 13 educational studios to transmitting facilities throughout the state of Ohio. The initial contract did not include the television translating equipment and was based upon a 15-year lease agreement with bi-yearly payments of $200,000.

In 1975, the Commission awarded CSI an additional $1-Million contract to provide TV translating equipment at nine stations capable of providing complete statewide coverage of any broadcast from the state-owned broadcasting studios. This fixed price contract has been completed.

The microwave system provides full duplex/video of multiplex channels connecting the 13 television centers. The multiplex channels provide connections for network telephone and data systems.



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MISSISSIPPI EDUCATIONAL TV NETWORK (METV)

SYSTEM: Simplex colored television program channel connecting the private homes and educational institutes throughout Mississippi with the State Educational Broadcasting Studios in Mississippi. The METV network has an overbuild voice communications system that provides five duplex voice circuits plus orderwire and alarm circuits. The five voice circuits are leased to Mississippi State agencies.

CUSTOMER: Mississippi Authority for Educational Television
APPROXIMATE VALUE: $3 Million over a period of a 10-year lease/buy contract
SYSTEM DESCRIPTION:
- No. of Sites: 18
- No. of Links: 17 ETV and 17 Voice Communications

MAJOR EQUIPMENT:
- 7-GHz Microwave System for Color Television Network and a 960-MHz UHF System for Voice System
- Liquid Propane Gas Generators as Power Back-up at 10 Repeater Sites
- 8-Hour Battery Back-up Capacity at all 18 sites
- Towers: 250 to 350 Feet
- Antennas: Fiberglass Parabolics for 7 GHz and Grid Aluminum Parabolics for 960 MHz
- Shelters: 8 X 18 Repeater Sites
- Tower and Shelter Foundations
- Selection of Repeater Site Locations

SYSTEM SUMMARY - METV NETWORK

Commercial Services Incorporated (CSI), a wholly owned subsidiary of Federal Electric, was awarded a contract to design, furnish, install, and operate and maintain the above listed equipments and systems on a 10-year lease/buy contract. The engineering department of Federal Electric designed the system, and CSI personnel performed the implementation and are presently performing the operation and maintenance. As can be seen from the following maps, the system provides complete coverage for the state and, in some areas, the educational broadcasts can be picked up on more than one channel of home or educational institute TV receivers. The broadcast from the educational studios in Mississippi includes pre-school to college level instruction, professional and industrial training, public service, cultural and environmental programs.

March 26, 1985

SUPERCOMPUTING: A HIGH TECH OPPORTUNITY FOR NEW YORK STATE

On February 25, the National Science Foundation (NSF) announced a five year, $200 million program which will establish four national supercomputing centers. Two of New York's research universities, NYU and the University of Rochester, are part of the 12 member Consortium for Scientific Computing, a group which campaigned for federal support for supercomputers, and which will manage the new John Von Neumann Center for Scientific Computing in Princeton, New Jersey. A second supercomputer center will be located at and managed by another New York university, Cornell. The foresight of a number of top level research scientists at Cornell, NYU, and the University of Rochester has insured that New York's institutions of higher learning are positioned on the cutting edge of new technology, ready to push the frontiers of knowledge forward.

Today's supercomputers are not simply faster, more powerful versions of the familiar desktop computer. More than thirty years of working with traditional computer design is bringing computer engineers up against the limits of the speed and power which can be expected from that design. Most supercomputers, on the other hand, work primarily on the principle of 'vector processing', and achieve their great speed by carrying out many detailed calculations simultaneously. Unfortunately, the beauty and conceptual simplicity of the vector processing idea is the main source of the increased complexity associated with programming

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a supercomputer. Because the natural way to structure problems in the physical sciences and engineering is to pose questions sequentially, researchers have been compelled to adopt a totally new approach to problem solving and our universities must provide training for this task.

With access to the Von Neumann facility, New York is poised to move ahead with advanced research in physics, chemistry, nuclear fusion, and aerospace science, while creating the necessary training ground for university and industrial scientists. This is crucial for the future economic development of the State of New York, because in the coming decades, industries will increasingly seek to locate their high technology plants in areas where there is a fertile environment for technological development via the supercomputer.

But the future is not yet ours. As things stand, two New York locations, NYU and the University of Rochester, will have access to the John Von Neumann Center. NYU is in close geographic proximity to Princeton, and will be communicating with the facility there through a high speed communication link, the T-1 line, capable of transmitting 1.5 million bits of information per second. Rochester, miles away, will communicate through a far less powerful line of 56,000 bits per second. Other New York universities will be free to communicate as they may, by telephone, courier, or U.S. mail, thus losing much of the gain in speed won by the new technology.

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For New York to maximize the benefit which can be derived from the participation of Cornell, NYU and Rochester in the NSF program, a New York supercomputing access network is needed. Governor Cuomo has said that his administration is considering the possibility of establishing a high speed communications network linking universities and industries with Cornell. While this is a worthy goal, it falls far short of the mark in two key areas. First, a New York net should connect several major centers such as Rochester, RPI, Albany, Buffalo, Cornell, Syracuse, Columbia, and Stony Brook to Princeton and each other via a T-1 line. Less costly local communications networks for additional educational and industrial users could be developed around these centers.

Second, in order to fully understand and organize the massive amounts of data being produced by supercomputers, it will be essential to have the ability to organize the material in graphic or pictorial form. Currently, our computers can produce multi-dimensional graphs and color pictures to help us understand complex physical phenomena. But the enormous computations associated with graphical efforts can require many hours of time and make realistic simulations impossible. Supercomputers can change all this and allow us to interact with and modify graphical models on an almost instantaneous basis. New York should supplement its communication network with a chain of high speed interactive graphics facilities.

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EXAMPLES OF

WHY BILL IS NEEDED

(SUPERCOMPUTERS)

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AUTOMATION MANAGEMENT

The Supercomputers Are Coming

The Empire State Is Seeking a Big Byte

by Paulette A. Mandelbaum

"SUDDENLY, supercomputers are hot," according to a recent new item in the business section of *The New York Times*, which reports that in the last year and a half, many U.S. firms are ordering the mighty machines. Today's supercomputers are 100 times more powerful than the standard computers recently used in scientific and engineering research. Computer scientists are promising that tomorrow's big thinking-machines will be another 1000 times more powerful than that. Firms in diverse U.S. industries are willing to pay $10 million to $15 million for each unit.

One of the key uses of supercomputers will be in simulation. The speed and power of the supercomputer will enable engineers to watch on a television screen the evolution of the effects of complex processes, even though the processes are not actually occurring. Currently, automotive engineers developing new car designs must test the safety and performance of their new designs by constructing prototypes and actually testing them in crash situations. Each design modification thus necessitates construction of new prototypes and additional road tests.

To adequately model the complex processes involved in real world phenomena currently takes many hundreds of hours of standard computer time, and only with the advent of the supercomputer has it become possible. In order to solve more complicated industrial problems, industry is voicing the need for yet more powerful computers. Industrial scientists want tomorrow's machines to pull together the various components of their puzzles and create a dynamic picture, drastically cutting the costs of experimental design work.

A poignant example of the beneficial uses of supercomputers for modern society is their use in avoiding environmental problems. Engineers cannot create small scale models of nuclear power plants and the densely populated areas in which they are found. Analysis of the risks associated with nuclear power is highly uncertain. The large number of simultaneous calculations which a supercomputer can execute will make it possible to watch a simulation of a reactor cracking on a television screen, and to note precisely where the radioactive plume is headed. The path of hazardous chemicals leaching into the aquifers which supply drinking water, cannot be assessed experimentally. Supercomputers will allow geologists to model such flows and accurately determine their pattern and predict their effects.

The use of supercomputers will not be limited to these specialized industries. Kenneth Wilson, Nobel laureate and physicist at Cornell University, who has been one of the most ardent advocates of supercomputing, has painted the most far-reaching picture of the potential commercial market for supercomputers. Wilson has described his view of the future by stating that "within a decade, industry will require thousands of supercomputers dedicated to scientific and engineering applications ... and the importance of the supercomputer systems to industrial profits will be measured in the hundreds of billions of dollars ... The majority of U.S. industry depends to some degree on the computerized application of science ..."

For all the attention the field is now receiving, supercomputing has not been an instant success in the United States. The variety and importance of functions which the supercomputer can perform were not well understood until the machines were actually produced. The development of supercomputing has been a slow and tortuous process. Its most loyal supporters have come from the Department of Defense (DOD) where the need for large number-crunchers has always been apparent, and from research scientists in academe who have been forced to shelve some of their most interesting projects because of a lack of computational speed and power.

The greatest boost in the uphill battle on behalf of funding and developing of supercomputers came from Japan. In the summer of 1982, the Japanese computer manufacturer FUJITSU announced that it would sell a machine that is six to eight times faster than any existing U.S. machine. The Japanese government informed the world that it would subsidize two joint industry-government programs: the National Super Speed Computer Program to develop a machine 1000 times faster than any machine in the United States today; and the Fifth Generation Computer Project to develop computers which will have artificial intelligence capabilities.

The entrance of the Japanese into

Paulette A. Mandelbaum, Ph.D., is legislative and regulatory analyst with the consulting firm of Chemical Engineering and Policy Analyses in Rochester, and a senior lecturer at the University of Rochester.

the supercomputer market quickly resolved the issue of who should pay to stimulate development of a high-cost technology. In July 1983, the NSF-sponsored Bardon report, "A National Computing Environment for Academic Research," proposed the creation of 10 supercomputer centers in he United States. On February 25, 1985 NSF announced the awarding of grants totaling about $200 million to four U.S. supercomputing centers over a five year period. Of the four centers, those located in San Diego, CA, Champaigne-Urbana, IL and Princeton, NJ, will concentrate on scientific and engineering applications of supercomputing, while the fourth, in Ithaca, NY, will pioneer uses of massive parallel processing techniques in the building of future generations of supercomputers. At this point the federal government has taken upon itself the task of providing the capital for initial development of supercomputing, with the computer industry contributing in-kind support, and with the expectation that the state governments and potential supercomputer users would participate in the effort.

Files more than 100 times the size of standard program files.

Of the $200 million in NSF awards, the Cornell Center for Theory and Simulation in Science and Engineering will receive about $35 million. In addition two other New York institutions, NYU and the Univeristy of Rochester, are among the organizers of the 12-member Consortium for Scientific Computing (CSC) which has awarded more than $75 million to establish the John Von Newmann Center for Scientific Computing in Princeton, NJ. IBM has promised a minimum of $30 million in manpower and equipment to the Cornell facility, and ETA Systems Inc., the supercomputer offshoot of Control Data, will provide more than $9 million in equipment and services to the consortium. Institutions participating in the consortium will share an additional $50 million in costs, and the state of New Jersey has awarded the CSC $12 million to build its facility in Princeton.

But the future is not yet assured. Upstate scientists and computer administrators are concerned about networking, which is simply the linking of computers and scientific and industrial computer users via telephone or satellite. Kenneth Wilson has been actively advocating networking for the purpose of improving the American scientist's ability to communicate with scientists at other research institutions. While progress is being made in the direction of creating a national science net for standard computers, linking supercomputer users is a more difficult problem. The standard lines in use for communication between computers at different locations generally transmit information at the rate of only 1200 to 9600 bits per second (bps).

Although this range of speeds is adequate for transmittal of information between people and computers, it cannot satisfy users of supercomputers. The basic motivation in using the giant number-crunchers is to exploit the potential of the new computer design to produce massive amounts of data, huger graphic files and bit-mapped printing files more than 100 times the size of standard program or word processing files, which rarely contain more than 1 million to 2 million bits. In order to transmit the quantity of data which the high-speed supercomputer produces, high-speed lines or satellite communication links of more than 1.5 million bps are necessary.

A comprehensive national network of this type would cost far more than the $100 million identified by Wilson as the price tag for a national science net. Larry Smarr, professor of physics and director of the University of Illinois supercomputer network has called for a supercomputing network. There is, however, little action on it currently. The NSF has accepted the responsibility for funding supercomputer links. Tentative NSF plans call for linking New York's supercomputer nodes (access points) to the machines by providing a T-1 link capable of transmitting 1.5 million bits per second, between NYU and John Von Newmann Center in Princeton, and a slower line capable of transmitting 56,000 bits per second, between Rochester and Princeton. Because Cornell has its own supercomputer center, there are no concrete plans at this time at NSF to link Cornell's Center for Theory with other research institutions.

Some of New York's supercomputer community see a need for a more comprehensive network within the state that would provide types of access which are regarded as crucial: 1) access to supercomputers for all research institutions in the state, and for all industrial scientists working jointly with universities; 2) access for all research institutions to both the Cornell and Von Newmann facilities, because the two centers have different purposes and functions; and 3) access for all research institutions using supercomputers to each other.

Robert McCrory, director of University of Rochester's Laboratory for Laser Energetics and trustee and vice chairman of the Board of the Consortium for Scientific Computing, underscores the importance of extending supercomputer access to all potential research oriented users. McCrory argues that supercomputers are too expensive to be located in every research campus. Although the establishing of the early conventional computer centers in the 1960s may have cost as much in real dollars as a supercomputer center costs today, he feels that neither the federal government nor the universities will foot the bill. He envisions connecting the state's 10 to 20 largest research institutions by means of high-speed lines or satellite to supercomputer facilities. Smaller colleges could lay short lines to supercomputer access points on the high-speed line, and could thus benefit form the supercomputers as well.

Richard Mandelbaum, professor of mathematics and vice provost for computing at the University of Rochester, says that broader access to supercomputing will bring additional numbers of university and

(Continued from page 28)

industrial researchers into contact with supercomputing. He explians that the supercomputer is not simply a faster more powerful version of the familiar desktop and mainframe machines, but works on the two principles of massive parallelism or vectorization. A crucial difficulty associated with supercomputing is that the natural way to structure problems is to phrase component questions in sequence, and not to break them down into simultaneous processes as parallelism requires, or into groups of identical calculations as vectorization requires. A totally new approach to computer problem solving is necessary for scientists whose scientific questions have led them to the more powerful computers, as well as for the designers of software. Broad access to the supercomputer facilities will enable New York researchers to move ahead with advanced scientific research and at the same time provide a training ground for university and industrial researchers, in which they will become thoroughly conversant with vectorization. As firms in the traditional manufacturing sector as well as high-tech companies increasingly seek to locate their personnel and plants where there is fertile environment for working with supercomputers, New York will be viewed as an advantageous place to locate.

The Center for Advanced Technology at Syracuse University is one campus which was not included in the supercomputing arrangement, although its prime activity is logic programming. Dr. Bradley J. Strait, director of the center, says he is "tremendously excited about the prospect of a high-speed network, which will enhance the capability for conducting advanced research at Syracuse many-fold." He added that since Cornell will be a site for experimentation with the massively parallel approach, while Von Newmann will be a high-speed production vector processor, a New York Net should connect New York institutions with each other and with both sites.

Funding for a New York Net and for further development of auxillary facilities for supercomputing ought to follow the pattern established by the four supercomputer proposals. The New York research schools will thus be looking to their own administrations, to potential industrial users and to the state for funds.

The idea of a New York research net funded in part by the state of New York has not been widely circulated in Albany. H. Graham Jones, executive director of the New York state Science and Technology Foundation of the New York state Department of Commerce, stated that his people "are keen to get a network which would link the major universities, so that they could access the supercomputer and each other." Jones cautioned that his agency did not necessarily support looking for the funds in the state budget. He indicated that the universities would have to reach out to industry for support, and suggested that IBM, General Electric, Kodak and Xerox were industries which might have an interest in the project. Staff to Sen. Walter Floss, chairman of the Senate Committee on Commerce and Economic Development, commented that at first glance it would seem that the more schools which could benefit from the NSF supercomputer grants, the better. Assemblyman Roger Robach, chairman of the state Assembly Commerce Committee, declared that he would be supportive of any way in which access to the supercomputers will bring jobs to New York.

While the politics of the New York Net is in its infancy, several points do emerge. Neither the NSF nor the state is likely to be willing to commit sufficient resources to construct the entire New York Net in its broadest form. If the state's institutions want to see a comprehensive T-1 or satellite network, their representatives should: 1) reach out to and recruit industry backing; 2) design and present a program to the state and to the NSF; and 3) educate the state Legislature about the potential benefits of the network. It may well be that if the state's scientists speak clearly to legislators and state officials, as Assemblyman Robach has suggested, they may feel that it is incumbent upon them to listen. ■

ing and Tom Whalen is Tom Whalen," said William Keefe, executive assistant to both mayors.

Keefe said he doesn't see much reason to compare the two men. He'll contrast their lineage: "Corning was the patrician, you know, and Mayor Whalen came from an Irish family, not well-off." As for their styles, Keefe said, "They're different, but they're different men." But Keefe offers little other than the fact that Corning chewed him out only three times during their 11-years together (the last of Corning's 42 years in office).

"And I deserved it one time," joked Keefe.

Whalen, the father of four boys and a girl, was elected city court judge in 1969, serving a six-year term. In 1982, he was elected president of the Common Council, leaving the following year to succeed Corning.

Whalen is seeking a four-year term, which pays $47,700 annually—only the fifth largest among the area's city and county officials.

Several party regulars say the lack of a single, widespread issue or error by Whalen, as well as the party's natural tendency away from primaries, led to the lack of Whalen opposition. Coyne said the steady stream of endorsements from top party leaders, including Cuomo, was also instrumental.

As Nelson put it, "Up here, nobody messes with Cuomo."

Through his ties with Corning, Cuomo became friends with Dorthea "Polly" Noonan, a Corning confidante and stalwart party worker. Cuomo installed her as the state committee's vice chairwoman, a position she recently resigned. There are few Whalen critics as bitter as Noonan.

"I don't discuss him," Noonan said of Whalen recently. She said she has no interest or involvement in mayoral politics.

Corning's son, international executive Erastus Corning III, caused considerable speculation with his return to Albany, shortly after his father's death. Joining his father's insurance firm, Corning was the center of considerable speculation regarding his political future. But nothing came of the talk. ■

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A Bright New Telecommunications Star for Innovative Sharing Between Schools

by Paul M. Seversky and James E. McGinnis

Two desirable goals of school boards and superintendents are increasing learning opportunities and improving the use of resources. School district sharing is one major way to bring about these priority goals. Sharing a telecommunications system, however, is a novel approach for schools in New York State. Itinerant teachers, transporting students to one common site, cable television, videotaped lessons, and even microwave television are techniques now being used.

Two upstate school districts, Perry Central School (1,320 students) and Warsaw Central School (1,115 students) have joined forces, sharing a unique telecommunications system by AT&T to increase learning opportunities for students and improve the use of human and financial resources.

A new device, the Gemini Electronic Blackboard, allows a teacher to write or draw on what looks like an ordinary chalkboard. Each letter, number or graphic written on the board is translated immediately into telephone signals that are communicated using the existing phone network to another site or sites. At both locations, the information is displayed on a regular television exactly as it was written or drawn on the electronic blackboard at the sending site, which is also equipped with an extremely sensitive microphone.

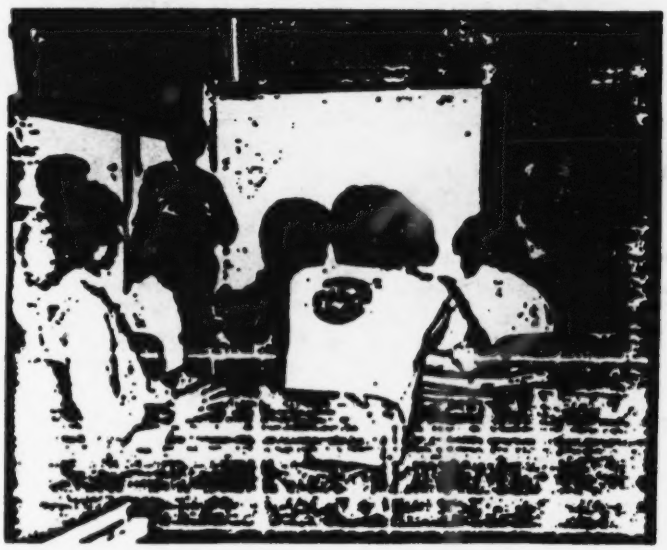
How It Works

Voice communication between the teacher and/or students at the sending school is made possible using a group audio teleconferencing device, called "Quorum". The Gemini Blackboard, in tandem with the teleconference Quorum, allows visual and audio communication between two or more classrooms instantaneously. For example, any location connected with another by a phone line can add or erase data by simply writing on the blackboard. At the same time the Quorum audio unit allows the various locations to discuss the changes being made on the electronic blackboard. Perry and Warsaw Central Schools combined talents to use this technology to increase student opportunities through sharing.

The first added learning opportunity made available to students using the AT&T Gemini and Quorum telecommunications system is a set of SUNY at Brockport college courses offered to the seniors at Perry and Warsaw. (See the story on page 18 for more details.) Their boards of education supported this innovative delivery system with budget provisions and encouragement.

It was arranged with little difficulty for the first two class periods of the day to be common at the high schools. Both offer advanced calculus and economics during these two class periods for senior students. These two courses carry local credit and may also carry college credit should the student so desire. The student who is interested in college credit realizes the requirements are more rigorous and must make application in the same way any person seeking undergraduate credit would. Textbooks for the courses are used free of charge.

An instructor for Brockport College is physically present and teaches from both school districts at various times on a scheduled basis. The local teacher at each high school co-teaches the course with the Brockport teacher. Each course carries three college credits, thereby making it possible for a student to gain twelve undergraduate credits in the senior year. These twelve credits are actual State University of New York undergraduate credits and are not to be confused with advanced placement program exam credits. Currently, there are 25 students enrolled in economics and 30 students enrolled in calculus. Out of the 55 enrollees, 42



Students at Perry Central study with the aid of the Gemini System and Economics Instructor Bill Manning (standing, left) and Calculus Instructor Louis Zentz (standing, right).

Dr. Paul M. Seversky is the superintendent of Warsaw Central Schools and Dr. James E. McGinnis is the superintendent of Perry Central Schools.

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ber of tuition enrollees from both Perry and Warsaw make the involvement of the college economically feasible.

The local teachers are very enthusiastic with this cooperative program since the curriculum was mutually developed with SUNY at Brockport staff during the summer. The program also has offered a teacher opportunity for professional growth and challenge. Feedback from the parents and students indicates a positive attitude plus support for additional course offerings in the future. Anyone interested in pursuing this innovative approach, should note the 10-point checklist as a guide for Gemini System Sharing at the end of this article.

Instructor Zentz uses the electronic blackboard, transferring his formulas to the Perry Central class who view the information on a tv monitor.

Is Gemini Practical?

From a practical standpoint the Gemini telecommunications system has allowed a learning opportunity to be added at both schools, while using and enhancing the grass roots talents of local staff. There are other ideas being considered by the local districts for Gemini use which offer added learning opportunities along with improving the use of available resources. Some of these plans include curriculum, in-service and management projects. For example, small school districts or school buildings within a large school district may use the Gemini to allow small enrollment classes to operate, especially in light of the proposed new mandates of the New York State Regents Action Plan. Instead of year 4 or 5 of a language going by the wayside because of small enrollments, the combining of such small classes from different schools with the electronic blackboard and one teacher without transporting students appears to be a practical use of Gemini.

Bringing outside resource people to a classroom setting is a proven curriculum tool. With Gemini, resource people from various colleges, universities, governmental offices and even countries can be interconnected with the classroom. Education for the adult community can also be expanded using similar techniques.

The in-service education of staff is a renewed statewide and nationwide priority. Gemini allows the convenience of on-site in-service education, including college graduate courses, off-site resource people and instructors. The Gemini system also offers a usable technique to make available on-site in-service for support staff personnel who often, because of time and expense, do not take part in refresher clinics or other types of in-service.

The Gemini System can also offer a usable management information system. For example, school districts within a BOCES unit could be connected with Gemini in order to efficiently share timely information in a quick and cost-effective manner. A realistic scenerio might involve all of the business managers of an area using Gemini to have a training session on changes in state aid forms and procedures. Such a telecommunications approach would reduce meeting travel time and would increase the time available for the task at hand.

The potential uses for Gemini described above are only some of the possibilities for added educational opportunities and efficient use of resources. Other uses may come about as experiments are done to combine Gemini with hard-copy transmission, cassettes, computers or other telecommunication systems like cable T.V.

What Are the Costs?

Such use is cost effective given the net cost of a Gemini System. The overall purchase price including installation for all of the equipment for one classroom is approximately $13,500. A service contract is also available from AT&T. However, the total local cost is reduced accordingly when the project has BOCES Coser approval. The Perry and Warsaw school districts will receive more than 50 percent BOCES aid. Also, federal grants appear to be applicable for the use of Gemini. The total cost may vary due to the type of monitor and yearly fluctuation of AT&T price listing. By projecting a conservative ten-year life span for the equipment, the unit-student cost is very reasonable. This cost decreases rapidly when additional students become involved in more courses or the equipment is used for other purposes.

Leasing the AT&T equipment is another available option. Other related costs include phone lines and, if necessary, long distance charges. Additional phone lines, long distance phone costs and operator-assisted conference system when in use. However, these phone lines can be used as regular conversation phone lines when the telecommunications system is off. Perry and Warsaw, along with other interested schools, are in the same local phone system. Inquiries are being made as to what telecommunication equipment exists which would allow conference calling capability without using operator assistance. Also, video transmission through phone lines in combination with the current benefits of Gemini would be ideal. Unfortunately, telephone line video

(continued on p. 32)

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raised occurs when this broad definition of "psychological test" is brought together with the term "academic instruction" and other broadly defined classroom activities.

Under the regulations, a psychological test which is not related to academic instruction is prohibited if it is directed, without parental consent, to any of seven enumerated areas. *Therefore, in addition to determining whether a psychological test occurred, the Department must also determine whether the activity taking place in the classroom, is "academic instruction"—which means defining course content.* Because advocates of the regulations are concerned about discussing personal values (at which the definition of psychological test is aimed) federal efforts to determine what is and what isn't appropriate academic instruction will require very subjective judgments of content and context. For example, *in teaching courses like literature, philosophy, history, or health education, it is difficult to imagine a meaningful classroom discussion without students expressing personal opinions about political affiliations, sex attitudes, anti-social behavior, etc.* These regulations empower the Department of Education to stand in judgment of what has transacted in the classroom and to judge whether the "psychological test" was administered in the context of (permissible) "academic instruction" or whether the teacher primarily had another (impermissible) purpose in mind.

Even where the teacher does administer a "psychological test" out of context of academic instruction, taken literally, some bizarre results can occur. For example, a student could not be questioned (that is, be given a psychological test), without prior parental consent, about a) suspected child abuse (it may be embarrassing to the family or critical of the parent), b) drug or alcohol habits (embarrassing and self-incriminating), c) opinions and beliefs about other students in connection with enforcing school discipline rules (anti-social behavior), d) information about medical treatment in connection with a medical emergency (privileged relationships), e) home environment for the purpose of improving home study habits, timely arrival at school, or truancy. These apply to all personnel— not just the teacher. Apart from the fact that school personnel have obligations in these areas under state law, the regulations begin to build a wall in the traditional student/teacher relationship.

For a copy of the Hatch Amendment and regulations, contact NYSSBA's Office of Legislative Services.

Schools

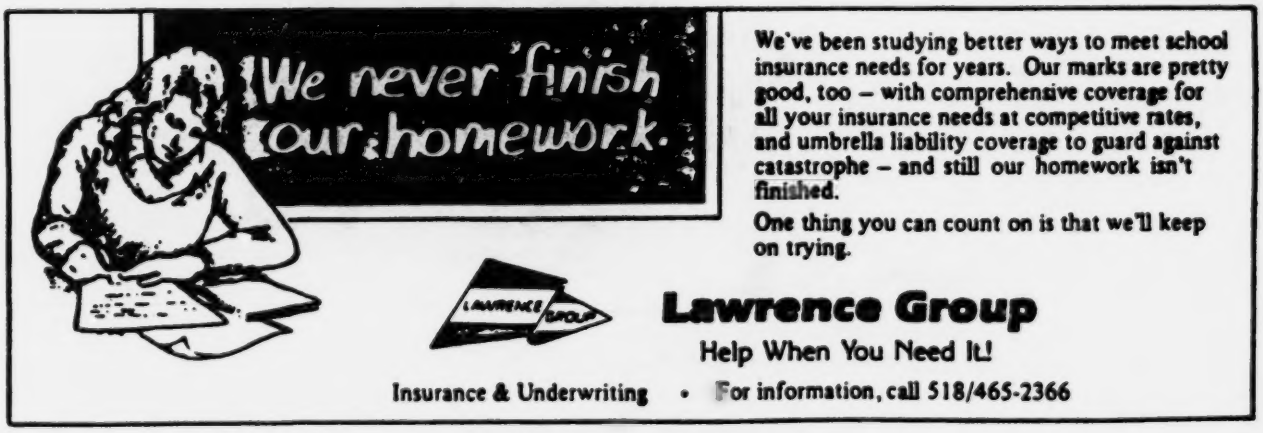
(continued from p. 13)

transmission is in the experimental stage and is still beyond the financial resources of most public schools.

The Gemini system does offer many innovative tools to bring about added sharing among small school districts or among school buildings within a large school district in a time-efficient cost-effective manner. Gemini can help schools address such priority goals as:

1. provide more course offerings locally or through higher education institutions;
2. improve the response to the educational needs of students and the New York State Board of Regents mandates;
3. equalize urban and rural opportunities for students and staff;
4. improve the use of financial resources through sharing;
5. improve the use of staff/teacher resources by sharing their talents among school districts.

Considering the start-up cost of microwave technology or the cost in money and time lost in transporting students, Gemini is a cost-effective delivery tool. By no means is this article suggesting that any telecommunications system can take the place of eye-to-eye contact between and among staff and students. It does suggest that small schools explore all techniques to increase human and financial resources.



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THE ROLE OF THE NEW YORK STATE URBAN DEVELOPMENT CORPORATION IN THE STATE'S HIGH TECHNOLOGY STRATEGY

A Report to the Governor

Submitted by: William J. Stern, Chairman and President
New York State Urban Development Corporation

Prepared in Association with the UDC High Technology Advisory Council

1/10/84
DEC 31 1983

December, 1983

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Peter Johnson
212-930-0301
UDC contact person

EXECUTIVE SUMMARY

The following report summarizes the recommendations of the New York State Urban Development Corporation's (UDC) High Technology Advisory Council. The 29-member Council was assembled by UDC Chairman and President, William J. Stern, at the direction of Governor Mario M. Cuomo to recommend specific proposals and projects that could spur high technology development in New York State. The report focuses on major sets of actions that have great potential for generating rapid job development and economic growth. These are: coordination of high technology resources, development of information technology, encouragement of biomedical and natural resources technology and improvements in the State's business climate (by changes in tax and legal policy), that can promote high technology development.

COORDINATION OF HIGH TECHNOLOGY RESOURCES. UDC proposes to form an association of New York State's high technology firms, the Governor's Association of Technology Executives (GATE), to foster essential communication between State government and this rapidly expanding sector of our economy.

INFORMATION TECHNOLOGY. It is estimated that, by 1985, information technology will account for 10% of the nation's Gross National Product. Encouragement of this high growth industry offers New York State the opportunity to generate and support rapid economic development, equalize educational opportunity for our citizens and improve communication between the citizenry and the State government. The report recommends that UDC carry out the following programs:

1) Establishment of the New York State Research Institute for the Information and Decision Sciences. Some of the most promising elements of basic research in the State would be pooled into an institute devoted to research and education on the storage, analysis, display and use of information. The Institute would assemble world-class scientists and researchers in a single location; assist public-private research that is potentially beneficial to State industries; offer unique educational services; and generate critical innovations in information technology.

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2) Develop a State Videotex System. Videotex is the display and processing of information on computer terminals. This pilot project would test the ability of the State to deliver its services through a videotex system with terminals easily accessible in locations such as public libraries. This system could result in considerably more efficient delivery of State services and enable New York to become the national leader in a rapidly growing industry that could reach $30 billion in annual sales by the year 2000. It would also serve to increase consumer acceptance of the new technology.

3) Establish a Statewide Computer Camp Program. Lack of computer training threatens to foreclose many career opportunities in high technology to young people, especially those in our minority communities. UDC proposes to utilize a Statewide network of summer camps to teach computer science to 1,000 disadvantaged minority youths each year.

4) Create a World-Class Information Mart. A highly visible national technology mart, currently planned as an element of the Times Square Redevelopment Project, would serve as a focus for trading information on technological innovations, demonstrate the State's commitment to the information industry and provide support for further industrial development.

5) Retention of Information Processing Departments. "Back office" clerical positions account for over 150,000 jobs in New York State's financial industry alone, but high costs for space and energy are driving the information processing divisions of many corporations out of the State. UDC proposes to stem the exodus of these jobs from New York State by developing sites and facilities uniquely suited to accomodate the information processing divisions of these corporations.

BIOTECHNOLOGY AND NATURAL RESOURCES. Biotechnology industries are beginning a period of phenomenal growth. Particular attention must be paid to State policies and programs that will encourage new firms to start and grow here. The report recommends that UDC undertake specific projects and that the Legislature consider modifications of existing statutes:

1) Creation of Biotech Facilities. New York State's national leadership in resident biotechnology research talents could be maximized by creation of laboratory-incubator facilities for small biotech ventures and investigation of plant and animal research facilities.

2) Repeal the Prohibition against
Space for Firms Involved in Cooperative
SUNY Faculty to encourage private sectd
development.

3) Repeal Article 32A of the Publi
unfairly restricts recombinant DNA rese
discouraging biotechnology firms from c
State.

4) Initiate an Aquaculture Demonst
Aquaculture involves the husbandry of a
plants) in controlled offshore facilit
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substantially the yields of hard clams,
scallops in New York State. Currently,
metropolitan area consumes nearly twice
seafood landed in all major fishing por
Carolina. Given appropriate support, a
could multiply New York State's shellfi
many jobs in this new industry while he
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IMPROVEMENTS IN THE NEW YORK STATE BUSI
Establishing New York State as a high t
require aggressive leadership by the Go
policy over several administrations. F
their research and development in New Y
likely to remain here to manufacture th
create new jobs. The report recommends
alterations to make New York State more
technology firms:

1) Formulate a Comprehensive Compu
Crime Act to protect firms doing high t
research, production and data storage i

2) Enact a 25% Research and Experi
on R&E Expenses to complement the exist
depreciable property.

3) Exempt Royalties from Patents t
development and production in New York

4) Extend Preferred State Tax Trea
to Outside Directors and Committees of
basis as that given to corporate office
small high technology companies can com
directors and scientific advisors.

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STATE BUSINESS CLIMATE.
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rate officers and employees so that
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5) Provide for a Separate Calculation for R&E Expenses which permits New York State-incurred R&E expenses to be allocated directly to New York State income so that R&E is treated as a preferred business expense.

6) Develop Special Depreciation Provisions that take into account the rapid obsolescence of high technology products.

These changes will make New York State considerably more attractive to emerging high technology companies, harnessing their tremendous future growth in production and employment for the benefit of our citizens.

ANNEX J

A PRELIMINARY REVIEW
OF
SATELLITE-BASED EDUCATION

SATELLITE-BASED EDUCATION

A Preliminary Review of the Feasibility of Satellite-Based Educational Communications Technology

New York State Senate Education Committee
Senator James H. Donovan, Chairman

NEW YORK
STATE
SENATE
ALBANY, NEW YORK 12247

SATELLITE-BASED EDUCATION

A Preliminary Review of the Feasibility of Satellite-Based Educational Communications Technology

New York State Senate Education Committee
Senator James H. Donovan, Chairman

Jeffrey P. Lovell
Director of Legislation

Richard D. Pfister
Director of Finance

Albany, New York
February 1, 1985

FOREWORD

In 1984, the New York State Senate Education Committee initiated research into the advantages of satellite-based educational communications technology. Its investigation indicated that the use of such advanced technology could benefit school districts and their students as well as State and local governments. The Committee recommended a temporary New York State Commission on Educational Telecommunications Technology Programs.

The Commission would expand upon the Education Committee's work by reviewing the existing state of educational communications technology, examining current instructional and administrative services provided by such technology, identifying what programs could be transmitted via satellite to the State's schools, and funding current research that has the potential to meet the needs of quality instructional materials and programs for schools via telecommunications technology. The Commission would then recommend to the Legislature any economically feasible plan to provide such educational technology services through various federal/state general purpose or authority debt or private business incentive funding mechanisms.

This report summarizes what the Education Committee learned during the course of its research and provides a general indication of the potential for educational telecommunications technology in New York State.

I am sponsoring legislation (Senate Bill # 1781) to carry out the recommendations made on page 9 of this report. Any suggestions or comments on this report or the legislation resulting from it should be forwarded to the Senate Education Committee.

The Committee will co-sponsor a special forum on educational and administrative uses of satellite technology at the Fifth Annual Learning Technology Fair on February 19 and 20 at Albany.

To acquire further testimony on the feasibility of educational satellites, the Senate Education Committee will conduct a hearing on March 6, at 10:00 a.m. in Hearing Room A, Legislative Office Building, Albany.

Senator James H. Donovan
Chairman, Senate Education Committee

UTILIZING THE NEW EDUCATIONAL TECHNOLOGY

Educational technology has made tremendous strides in the past two decades. From the textbook, blackboard, and occasional films and filmstrips that were the mainstays of teaching for years, education has taken a quantum leap into the future with the growing use of computer-assisted instruction and video equipment into the classroom. They are helping each student to proceed at his or her own pace, advancing to new lessons as he or she is able to master the material.

Computer-assisted instruction allows all students to benefit from drill and review without requiring constant teacher intervention. It enables more gifted students to advance at a faster pace than their classmates. Teachers are freed to assist students who have difficulties and to develop new and innovative lessons and materials of their own.

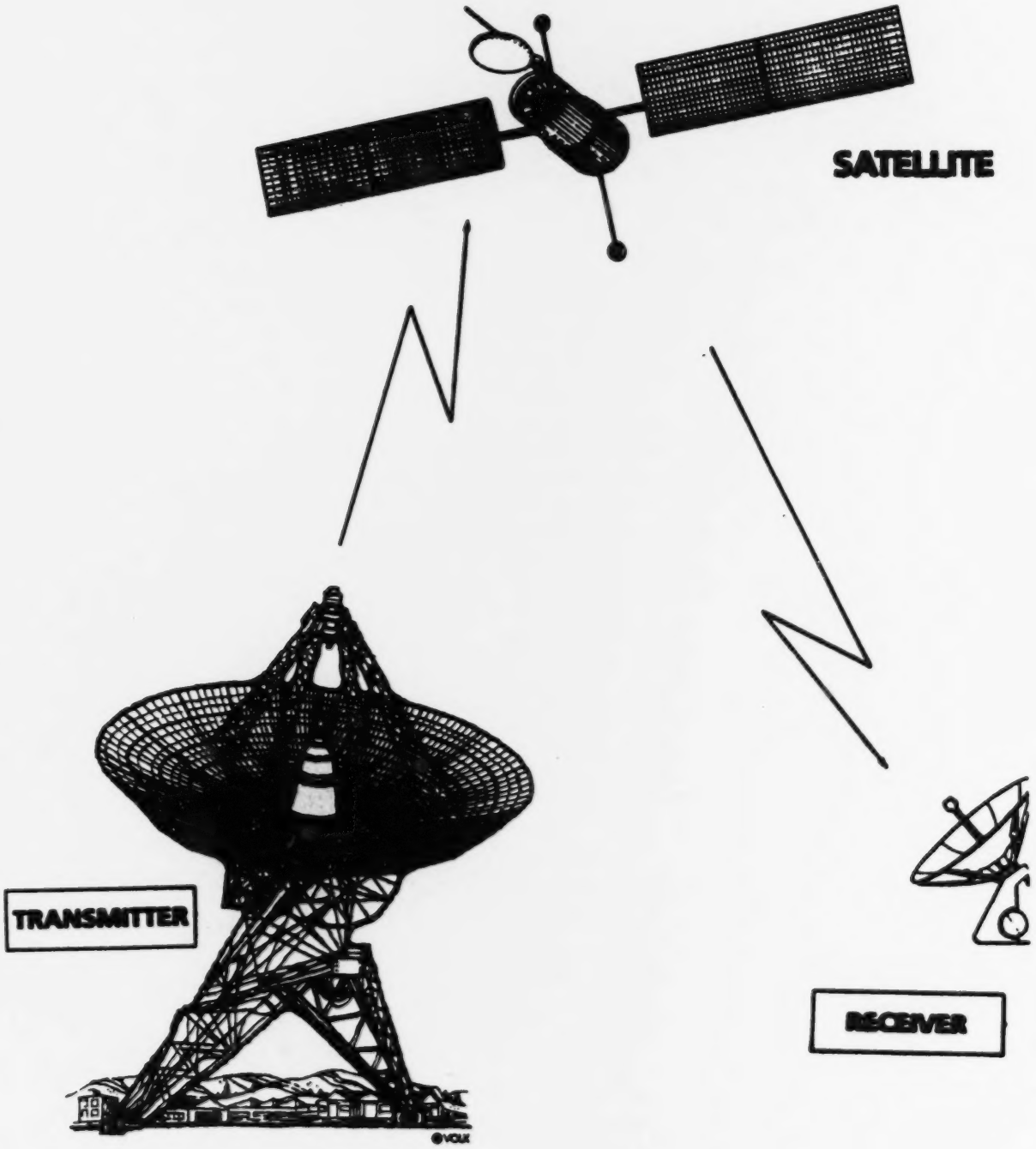
Teachers using video technology may select commercially-developed packages or develop their own programs, either individually, with other faculty members, or with their students. Many schools are now hardwired with cable to take advantage of this technology and some even have inexpensive television studios in which they can produce their own programming. Interactive video, or teleconferencing, can take this concept one step further; special lessons can be broadcast from a central site while classrooms on the receiving end can ask questions by telephone that are then answered on the air. Several commercially-produced instructional programs make use of this concept in which, after initially accessing the central computer by telephone, the student at his or her microcomputer station can participate in the program.

As envisioned in this report, such advanced educational communications technology would not be limited to elementary or secondary schools. Educational personnel could benefit from the training potential of such a system while administrators could gain from its information sharing capabilities. Libraries could be tied into the system to provide research and reference services. The State University of New York's community colleges, four-year campuses, and university centers could be tied in to help fill educational, administrative, and research needs.

Satellite communications would generate their greatest savings in instances in which satellites broadcast to many scattered reception sites, but the network could provide additional savings where hardwire connections were not economically feasible or in which video was required. Holding statewide or regional meetings by teleconferencing would provide another avenue for potential savings; the savings in transportation and housing costs could, in many instances, greatly outweigh the cost of the video and audio hookups in situations where dissemination of information is the primary goal.

As communications technology advances, New York State needs to consider how to best supply it to all students in the state, giving each student an equitable opportunity to benefit from both the best possible instruction and the hardware that is rapidly becoming standard in business and industry. However, it does not come cheaply. Some school districts possess the financial resources to support their pioneering utilization of the new educational technology, but many

do not. The state, with its inherent advantage of economy of scale, can take the lead in introducing the new technology and can, as this exploratory report will outline, provide some services that even the more affluent districts cannot afford.



IMPETUS FOR A STATEWIDE EFFORT

New York State would not be the first state to embark on an effort to harness the new educational and communications technology on a statewide basis. Alaska, has initiated its own program and others are underway in northern California and Illinois. Alaska required an innovative program due to the great distances between its scattered settled areas. Programs in other areas are just coming into their own, as declining costs and improving technology make them possible.

The successful placement of satellites in orbit from the U.S. space shuttle has drawn attention to the growing ease with which satellites may be launched. In November 1984, the space shuttle Discovery retrieved two satellites (Western Union's Westar VI and Indonesia's Palapa B2) and brought them back to earth, where they are being refurbished for resale by the insurance underwriters and for eventual relaunching.

The possibility exists that New York State could purchase one of the satellites recovered by the space shuttle and use it for an advanced communications program. Initial research has been undertaken into what such an effort would cost versus the benefits it would provide.

Recent news articles regarding lower-than-anticipated demand for satellite communications services suggest that leasing costs for satellite transponders will remain relatively reasonable for the next few years. If the demand for this unused capacity remains low, New York State may be able to negotiate very favorable lease rates, thus providing a lower start-up cost or enabling the state to invest more into equipment for schools and other institutions that would be part of its network.

Components of an Advanced System

If New York State either purchased a satellite for launching or leased part of an existing communications satellite, certain equipment, or hardware, would be needed at the outset. The essential component is, of course, a satellite. Such a satellite would have to be in geosynchronous (or geostationary) orbit, which means that its orbit would be fixed over one point on the earth's equator to enable broadcast and receiving equipment to be pointed in a fixed direction to provide for the clearest possible transmission relay and ground reception. All American communications satellites are in such an orbit and are actually spaced across an arc of the sky directly above the equator. Ground stations can focus on the satellite from which they would receive the clearest signal -- namely the one that is highest above the local horizon (the higher above the local horizon a satellite appears, the smaller the antenna dish is that is required to receive an acceptable signal and thus the lower the cost of the purchase or construction of such a dish).

Also essential to any communications system based upon satellite usage are ground stations, also known as downlinks, designed to receive the signals relayed back to earth from the satellite. Without ground stations, there is no

system. They can be relatively simple, consisting of an antenna, signal decoding equipment, and cable that link the ground station to the video, computer, and/or other telecommunications equipment that are used in the system.

A satellite-based communications system requires a source from which information is transmitted. If New York State were to become seriously involved in the forefront of educational technology, it would probably wish to develop many of its own programs even if were going to use any or all of the services available commercially. Depending upon how much the state develops its own materials, the state would need to invest in one or more uplinks, or transmitting stations.

Communications System Costs

A considerable range of system packages could be developed for New York State. New York could follow several routes, depending upon whether it wanted to emphasize decreased satellite costs or decreased downlink costs.

If the State were to utilize a C-band satellite (so designated due to its frequency transmission range), downlinks would require antenna dishes three to five meters in diameter. (Dish size for New York and other Northeastern states is a little larger than for states to the south and west due to the position of the existing satellites above the local horizon.) Downlinks would cost from $5,000 to $10,000 apiece, installed, depending upon the manufacturer, site preparation requirements, and the distance that cable must be run from the downlink to the local video or other equipment designed to use the programming being beamed to the downlink. Although C-band satellites have the advantage of immediate availability, relatively reasonable cost, and proven reliability, their inherent disadvantage lies in the comparatively high cost of their downlink components.

Direct broadcast satellites (DBS), which use transmission components of up to 200 watts power compared with the five to eight watts in C-band orbiters, will require less expensive downlink equipment. One NASA consultant estimated that DBS downlinks will cost only approximately $1,000 -- a savings made possible because the higher DBS broadcasting power will require antenna dishes only one meter in diameter. A satellite communications consultant projected even greater savings if the downlinks were purchased in quantities measured in the hundreds or thousands (there are, for example, approximately 6,000 school buildings in New York State); costs could run as low as $200 to $300 plus approximately $100 apiece for installation. Installed DBS downlinks, if purchased in quantity, would thus cost only a small fraction of what C-band equipment now runs. However, there are no direct broadcast satellites immediately available for New York State use. Implementation of private enterprise plans to launch DBS satellites is presently dependent upon obtaining sufficient financing.

A variation on the DBS option, which broadcasts in the 11.7 to 12.2 GHz compared with the 12.2 to 12.7 GHz for true DBS, could offer nearly comparable savings on downlink costs (though moderately larger, and therefore moderately more expensive, receiving dishes would be needed because the frequency and the satellite wattages are lower). This lower range "DBS" has the advantage of being immediately available, but it has a drawback in that heavy rainstorms can temporarily interfere with signal reception. One test operation noted four losses of

signal due to rainstorm interference over a nine-month span in 1984, with the longest of those lapses being ten minutes.

Uplinks, or ground-to-satellite transmission sites are considerably more expensive than downlinks, as would be expected when one compares the cost of television broadcasting with television reception equipment. Uplinks would cost anywhere from one-half to one million dollars apiece depending upon the sophistication desired and site preparation costs. One experienced telecommunications facilitator from a Midwestern state estimates that an uplink would cost New York $750,000, including the land and necessary engineering study, but not including studio costs. A transportable unit would cost close to the $1 million figure.

New York would also have several options for satellite usage. Purchase cost of a C-band satellite would be in the $25- $35 million range. Launch costs would add another $18- $20 million while operational and service costs would add several million annually. Purchase of one of the recently recovered satellites could possibly save several million dollars versus the purchase price of a new satellite, but launch and operational costs would remain the same according to NASA officials. Satellite communication authorities recommend a two-satellite package, with a back-up satellite in orbit waiting to be activated in the event of uncorrectable problems occurring with the primary satellite. Such a two-satellite package would cost approximately $100- $110 million. A seven-year life span should be anticipated for such a system.

Although a fairly firm purchase price is not readily available for a direct broadcast satellite, it is estimated that their purchase prices will run two to three times higher than that of a C-band satellite once DBS systems come on-line.

Leasing Option

Leasing of a dedicated transponder provides a particularly attractive developmental route from a cost standpoint. A C-band satellite transponder, which is the rebroadcast element in the satellite, could be leased fulltime for approximately $1 million per year. Part-time leasing packages could also be obtained, but savings would result only through limitation of usage to the less desirable hours. Firm leasing figures have not yet been obtained for DBS transponers, but their cost is expected to run several times that of C-band transponders. One transponder would simultaneously handle one video channel and up to several hundred audio or computer channels, the exact number dependent upon the technology used (multiplexing and compression adds greatly to the transmission capability). Leasing a half transponder would provide video capability but would eliminate most simultaneous audio capability.

Downlinks and uplinks should be steerable in the event that New York State might want to change satellites at some future date once it initiated its own satellite system, whether it involved a state-owned satellite or only a leased transponder. Lack of steerability would incur considerable ground costs if a change in satellites were needed or desired. Downlink owners might also wish to consider licensing their sites to protect them from interference, such as from microwave transmission paths that could be installed over unlicensed downlink sites.

Other Options for a Communications System

A satellite-based system is not the only approach New York State could take to develop an advanced communications system for education. Interactive communications have been available for computers over existing telephone transmission lines, but these cannot handle video signals. Coaxial cable could provide the necessary transmission capability, but installation costs to every school building across the state would be prohibitive, even with lease arrangements with existing cable television franchises. Cable for home television costs $6 to $7 per foot installed. If a statewide educational cable network could utilize existing utility poles, the cost of installing just the cable for such a system would run over $34,000 per mile. With a conservative minimum of 10,000 miles of cable needed to interconnect all educational buildings and libraries in the state, upwards of $340 million would be needed to bring the system into full operation. Pole rentals for such a system, at a moderate fee of $5 per pole per month, could run as much as $16 million per year. As will be seen shortly in this report, a system based upon a leased satellite transponder would offer tremendous savings.

Some cost benefit could be obtained over coaxial cable by connecting school districts with microwave transmission facilities. Yet these, too, would be expensive. With tower costs ranging from $100,000 to $150,000 each and a realistic average separation between towers being ten miles, tower construction costs for a system spanning a minimum of 10,000 miles would run approximately $125 million. Further, microwave systems in New York State suffer wintertime damage due to ice build-up. They also pose potential health risks. Though not conclusive, studies have indicated that close proximity to microwave equipment could produce undesirable side effects.

Fiber optics technology, which is still in its developmental stage, promises to offer the transmission capability desired and it could undercut the cost advantages of satellite systems. However, the technology is not readily available for mass installation. It is unlikely that widespread use of fiber optics for long-distance communication will become a reality for another decade. Once it is available, New York could utilize a statewide grid linking schools, libraries, and government facilities. Because optical fiber systems will be able to carry significantly more signal information than would be needed for an educational communications system, the state would probably find it more economical to lease from a commercial system rather than install its own. If New York leased from a commercial optical fiber system as it was installed across the state, it could gradually phase out its leased satellite system, scaling down its transponder use as the optical fiber network assumed more of the communications responsibility. Once it is installed, an optical fiber network will have the advantages of freedom from interference and superior transmission capabilities. But until that technology becomes available on a widespread basis, a satellite-based system appears to offer the best alternative.

DEVELOPING A QUALITY EDUCATIONAL COMMUNICATIONS SYSTEM

There are legitimate reasons for New York State bringing its educational system into the forefront of the communications system. The new technology:

- enables educational systems to provide instruction to each student at a pace that best suits his or her abilities and needs;
- enables teachers to spend additional time assisting students who have difficulties, as well as enriching existing courses of study;
- if state-supported, enables less affluent and smaller districts to take advantage of commercially-developed materials at a much reduced cost;
- gives all students an opportunity to develop familiarity with the technology that is rapidly becoming a standard in business and industry, making the state's students more competitive in future job seeking and making New York a stronger competitor for the new businesses and industries that could strengthen the Empire State's economic revitalization efforts; and
- enables school districts to speed their record keeping and administrative tasks, freeing staff time for program development.

Noneducational Benefits

The communication revolution has not been limited to education alone. There has been a parallel information revolution which has had substantial impact upon libraries across the nation. The state's libraries could be tied into the educational communication network to strengthen their own information resources while assisting school libraries and instructional programs by providing research and program assistance that schools may lack.

In addition, state and local governments could benefit from a statewide satellite communications network. Teleconferencing could cut meeting costs up to half through the elimination of travel in those instances where the basic presentation would not require involved group discussions (it would also still allow for question and answer sessions). Training materials could be disseminated via the network and data could be sent back over the system to central collection and analysis points.

The Future

Based upon cost and availability, a satellite-based system has advantages over any other technology. A switch to a fiber optics network in the future would not make the existing downlink equipment useless as long as television and educational programming from other sources were still carried on satellites.

At this preliminary stage it seems that three options, with varying levels of commitment to a satellite-based system, are essentially available to New York State. The cost estimates are based upon the use of the C-band satellite technology which is presently available.

Option A, which would involve the greatest commitment, would have New York initiate a northeast or eastern seaboard states cooperative to acquire and launch a satellite for education and government. There would be an initial buy-in cost of slightly over $80 million, which could be at least partially offset by leasing unused channel space to private communications operations or perhaps by reducing intra-state long distance telephone communications costs. Bonds with a fixed seven to ten-year payback would be issued by a public authority to initiate the venture. A major uncertainty with this option revolves around the willingness of other states and private enterprise to become involved with the venture. Option A envisions ten to twelve uplinks located in selected metropolitan areas across the state. A minimum of 1,000 downlinks would be included in the package.

Cost Estimate:		
	Satellite Purchase	$30 million
	Launch	20
	Operational Costs (7 years)	14
	Uplinks (10-12)	8
	Downlinks (1,000)	10
	TOTAL	$82 million

Option B would have New York lease a dedicated satellite transponder, providing one video channel and several hundred audio channels for state educational and governmental use. Entering the field on a "test" basis, the option would still envision ten to twelve uplinks strategically sited across the state but would only provide approximately 300 downlinks when fully implemented. The system would have the capacity for utilizing existing commercial educational packages and would, with its strategically located uplink sites, enable school and BOCES districts and state agencies to develop and disseminate programs of their own. This option provides an economy of scale without committing the state to a satellite purchase that would require it to involve other users.

Cost Estimate:		
	Transponder Lease (7 years)	$ 7 million
	Operational Costs (7 years)	7
	Uplinks (10-12)	8
	Downlinks (300)	3
	TOTAL	$25 million

Option C provides a model for a much reduced commitment to satellite-based communications. It would have the state provide a single uplink site in Albany and provide for the purchase of 60 downlinks. Transponder time would be leased on a per hour basis for the limited programming that could be made available. In return for lower start-up costs, the state might consider providing computer terminals and other hardware that downlink users would need.

Cost Estimate:		
	Operational Costs (7 years)	$ 7.0 million
	Uplink (1)	0.8
	Downlinks (60)	0.6
	Computer Terminals (2,000)	2.0
	TOTAL	$10.4 million

Figures in each option are estimates
numbers of elements in each option are not absol
convey reasonable approximations of intensive, mo
levels.

re estimates based upon current costs. The
are not absolute, but are instead intended to
intensive, moderate, and minimal involvement

System Implementation

Several steps are recommended for the
the New York State Legislature should create a t
sion on Educational Telecommunications Technolog
members including four members from the State Sen
Assembly, four appointed by the Governor, the
Commissioner of the Office of General Services,
University of New York. The Commission would
undertaken by the Senate's Education Committee by

ended for the implementation process. First,
ld create a temporary New York State Commis-
ons Technology Programs to consist of fifteen
the State Senate, four members from the State
Governor, the Commissioner of Education, the
al Services, and the Chancellor of the State
mission would then build upon the research
Committee by:

- reviewing existing educational techno
in computer and telecommunications in

ational technology practices and developments
unications information technology;

- examining current instructional and
by such technology;

uctional and administrative services provided

- identifying appropriate educational s
transmitted via satellite to schools

educational software and media programs to be
e to schools in New York State;

- funding current research with potent
instructional materials and programs
tions technology; and

h with potential to meet the needs of quality
and programs for schools via telecommunica-

- recommending, to the Legislature, an
provide such educational technology s
state general purpose or authority de
funding mechanisms.

egislature, any economically feasible plan to
l technology services through various federal/
r authority debt or private business incentive

The Commission could also develop the strateg
advanced educational communications system; i
utilize third-party services to obtain the best p
equipment it would recommend leasing and/or pu
possess the expertise to determine the specifics
State to follow in enhancing its educational sy
tions technology.

the strategy for the implementation of an
s system; it might, for example, wish to
ain the best possible rates and prices for the
ing and/or purchasing. The Commission would
the specifics of the best course for New York
educational system through the new communica-

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ATTACHMENT

The Northeast Perspective

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SATELLITE TECHNOLOGY: SOME OF ITS IMMEDIATE APPLICATIONS IN THE SEARCH FOR EXCELLENCE IN EDUCATION

James H. Connett

If it were necessary to communicate with every school district in the United States within a short time and at one time to carry out an inservice regarding a new breakthrough in classroom instruction, could it be done? Is the technology available? Would it be economically feasible? The answer to all three questions is yes. Such an effort could be carried out with the use of satellite technology.

The technology for accessing satellite transmissions is operational and relatively simple. To trace the delivery of an event we begin with a program being produced live or played back on tape. This program is connected to a special type of transmitter known as an uplink. Once the uplink receives the program, it transmits the program directly to a predetermined satellite and predetermined transponder or channel number. Once the satellite receives the signal from the uplink, it instantaneously rebroadcasts the signal back to earth. A special receiver called a downlink receives the signal broadcast and converts it to a television picture and audio so that it may be seen and heard on a standard television set. Hundreds of broadcast services in several languages are currently using this system for entertainment, educational, and religious programming. Communication satellites are also used extensively for relaying long distance telephone calls and for the transmission of data processing information.

What does all this mean for education?

1. Costs for travel to meetings at both the state and national levels can be reduced dramatically as many education-related meetings and conferences can be conducted by interactive, satellite-delivered, video-teleconferences instead of face-to-face meetings.
2. Because of low cost, it will be possible for any individual school that can afford a micro computer, to afford a downlink receiver.
3. When the programming is available it will be possible for every educator to keep current on a daily basis concerning the latest in educational research and innovative programs regardless of that educator's geographic location.
4. It is now possible to conduct inservice programs for large numbers of teachers and adminstrators in "real" time.
5. The problem of timeliness in the dissemination of educational information will be solved to some degree.

It is important that educators understand that this technology has mindsets and limitations to consider. For instance, this technology must be used only when appropriate, and educators should not expect the same kind of performance from educators presenting on television that they expect from professional actors.

Television can no longer be thought of as solely a vehicle for entertainment. It must be viewed as a delivery system. Finally, the development of the educational use of this technology will undergo experimentation and growing pains.

This past year Secretary of Education, T.H. Bell, funded and produced some of the first national teleconferences for education with the Project BEST Program. Beginning in September 1983, three National Diffusion Network Facilitators - B.J. Confer, Arkansas; David Lidstrom, Iowa; and Jim Connett, Kansas - produced and hosted four video teleconferences, each three hours in length, that showcased twenty Developer/Demonstrator Programs from the NDN pool of programs. The audiences of some of these events ran as high as 10,000 educators from as many as 100 sites located in forty states with Alaska, Hawaii, and Puerto Rico participating.

During the 1984-1985 school year, the same three NDN Facilitators have been granted funds to produce up to twelve satellite-delivered events for the NDN. In addition, the Northeast Regional Exchange, Inc. will conduct three video teleconferences, based upon **Computers in Education: A Mid-80's View.** Excerpts taped during this October 1984, event will be shown on the same day as the NDN productions.

The schedule for the first three NDN events is as follows:

February 15,1985	Technology in the Content Areas.
March 15,1985	Preparing Students to be Effective Learners: Science
April 19,1985	Critical Thinking/Problem Solving.

These events will be broadcast via Westar V Transponder 12X Channel 25, from 12:00 Noon to 3:00 PM EST. (If you require additional information about these or other events that are scheduled, contact the NDN facilitator in your state.)

The greatest enemies of change in education are time and distance. Change is a significant element in the quest for excellence in education. If these two factors to some degree can be overcome, change can be effected, and excellence can be reached. Satellite technology appropriately used, can play an essential role in the search for excellence in education.

James Connett is Director of the Kansas Educational Dissemination Diffusion System. He collaborated to produce four National Diffusion Network video teleconferences in 1983 and is assisting NEREX in preparing for future teleconferences.

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DELIVERY OF INSTRUCTIONAL MATERIALS USING A COMMUNICATIONS SATELLITE

Louis A. Bransford and Mary Diebler
The Public Service Satellite Consortium
Washington, D.C.

ABSTRACT

The state of the art in satellite technology is dynamic. Changes are occuring on a daily basis. New systems are emerging with the capacity to keep pace with increasing demands, although questions of supply and saturation continue to be raised. Telecommunications in the public service has definitely been evident in the last decade, and from all indications, will increase dramatically in the next decade. What about the field of education? Facilitating innovation in education, because of its fragmentation, is a complex task. How can educational institutions adopt and implement telecommunications technology? How will the schools adapt their planning, budgeting, and operating practices to meet the requirements of alternative distribution systems? This report addresses the issues of effective utilization of advanced telecommunications technology in the schools.

INTRODUCTION

The last decade witnessed a driving move from experimental communications satellite usage toward a slow but steady growth in technology transfer to current domestic systems. The 1980's hold much promise of increased technological advancements, making satellite communications technology available to the masses. On the wish list we find that public service applications are mentioned often, but relative to our assigned topic, what are the realistic prospects for the field of education?

Education and communications satellite technology are not strangers. In fact, they've been courting for over a decade. The Pacific Basin area has made extensive use of the ATS-1 experimental communications satellite, launched in 1966, for educational programs such as PEACESAT and USPNET. Alaska has also utilized ATS-1 since 1971 for distribution of health and education programs and services. It is worth noting that from a very modest beginnning on ATS-1 and ATS-3, Alaska has made the transition to commercial satellite services and will acquire its own dedicated satellite in late 1982.

The ATS-6 experiments in 1974 and 1975 marked the beginning of a new era in educational technology, demonstrating the provision of improved educational and health services to such geographically remote areas as Alaska, Appalachia, and the Rocky Mountain region, heretofore isolated from desperately needed services. The most recent experimental satellite was the CTS, a joint project of the U.S. and Canada, which operated from 1976 to 1979. Of the 20 approved long-term experiments and 146 one-time demonstrations using CTS, six experiments and 64 demonstrations were educationally-oriented. CTS was a unique satellite in that it operated at higher frequencies and with much greater power allowing the earth stations to be smaller, more portable, and relatively less costly.

Yet, when the experimental satellites were no more, most of the public service groups terminated their satellite communications usage. Why, after such a long courtship, can't education and communications satellite technology enter into marriage? Is it a question of resources, incompatibility, or simply immaturity? To better understand this reluctant couple, we need to examine the condition of education as affected by telecommunications.

COMMUNICATIONS SATELLITE BACKGROUND

There are thirteen U.S. domestic communications satellites currently operating, with the FCC authorizing the launch and construction of at least 25 more. The 144 transponders, or channels, looking at the U.S. in 1981 will increase to 300 in 1982 and 600 by the end of 1985. This seems like quite a few until it is realized that presently it takes one full transponder to accommodate one full motion video signal. Compression techniques, which are discussed later, will maximize transponder capacity. (A complete list of current and projected U.S. satellites is appended.)

How do they work? Communications satellites are really just microwave towers in the sky, reflecting transmitted signals to ground receiving stations.

The satellites are positioned 22,300 miles above the Earth over the equator. At that altitude they become "geostationary"; that is, they orbit the Earth at the same speed the Earth spins, causing the satellites to appear to remain in one place. Thus, a fixed earth antenna can focus on them, using them continuously.

One advantage to using communications satellites is the large area the signal can cover. The antenna coverage, or "footprint", of a satellite covers about one-third of the Earth's surface--enough to encompass the continental U.S., Canada, Alaska, and Hawaii, with the exception of the extreme northern and southern latitudes.

Such coverage enables satellites to be distance-insensitive. Once a signal is up to the satellite, it costs no more to transmit the signal to a point 2000 miles from the point of origin than it does to transmit the signal to a point two miles from the point of origin. Land communications, on the other hand, are very distance-sensitive. A look at long distance phone rates confirms this.

Satellite communications are particularly well suited for simultaneous communication among a large number of locations. It takes only one-fourth of a second to transmit a signal up to a satellite and back to Earth. A special antenna, many of them only ten feet in diameter and shaped like a round dish, receives these signals. There are over 5000 of these satellite receiving "dishes" nationwide in use by cable systems, public television stations,

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hotels, and hospitals. The most prevalent ad hoc network nodes available today include:

Type of Facility	Number of Nodes
Public Television Stations	160*
Holiday Inns	286
Hospitals and Medical Facilities	300
Transportable Earth Stations (receive only)	220
Various "Independent" Facilities (hotels, libraries, etc.)	hundreds

*Eight more stations will be going on line soon, and an additional 127 stations can be reached through state microwave relay systems.

Interest in using satellite communications for occasional programming is rapidly growing. Conference sessions, continuing education, seminars, and instructional materials are a few of the types of programs using satellite delivery and distribution. Through the use of satellites, travel time and money can be saved, more participants can be reached and served, and materials and resources can be shared.

And what of the future? Technological advances, such as those listed below, will make satellite communications even more accessible.

Direct Broadcast Satellites (DBS)

DBS technology can bring about low cost, rooftop satellite receiving stations (less than $1000 per unit) and a revolution in commercial television. Currently, 14 groups have submitted proposals to the FCC, of which nine are considered serious. Once approved by the FCC, DBS will concentrate on service as a mass communications medium affordable to individual residences.

Video Compression

As previously mentioned, a full transponder is needed per video signal. By 1983, however, bandwidth compression techniques should permit transponders to accommodate more than one video signal, making satellite transmission even more economical. Since satellite time will continue to rise in demand, such techniques will be instrumental in future transponder accessibility. The predictions are that bandwidth compression will permit a video signal to be transmitted using only ten percent of a transponder.

Ku-Band Satellite Networks

Except for the U.S. SBS and Canadian ANIK satellites, current domestic satellites operate in the 6/4 GHz frequency range (C-Band). Most of the present earth station networks are compatible with these frequencies.

The newer generation of satellites, however, is evolving to 14/12 GHz (Ku-Band). This phenomenon has sparked earth station manufacturers into creating a new line of Ku-band earth stations as well as a hybrid, commonly called a Torus antenna, which is able to accommodate both C-Band and Ku-Band frequencies.

Use of Ku-Band frequencies and subsequent Ku-Band networks will open up a new range of satellite communications opportunities, providing more service alternatives in the wake of a crowded C-Band.

THE NATURE OF VOCATIONAL EDUCATION

In keeping with the theme of the conference, let us now examine public vocational and industrial education and training. The focus of this paper, however, will be on vocational education because, interpreted in its broadest sense, it has tremendous implications for education in general, and because vocational education is most amenable to advanced telecommunications.

The 1970's and early 1980's are finding vocational education becoming even more an integral part of American education, often segmented into special categories: technical education; industrial education; career education; occupational education; and professional education. No longer is vocational education limited to non-college prep students or available only in specialized institutions.

In their 1980 report, the National Center for Education Statistics (NCES) found almost 28,000 institutions offered some type of vocational education from graduate schools to correctional facilities. Two-thirds of these institutions were at the secondary level where, until 1981, federal funds were more readily available. Of the nearly 20 million vocational students enrolled in these institutions, 65 percent were secondary students and 35 percent were postsecondary students.

Where can vocational education programs and students be found? Let us share some interesting observations with implications for telecommunications. While only 27 percent of the population lives in areas with under 100,000 residents, 60 percent of the secondary schools offering at least five vocational education programs can be found there. Post secondary vocational programs, however, are largely located in multi-town service areas.

The NCES statistics profile the vocational education student as secondary, rural, with a good chance of being a minority, and interested in consumer/homemaking or office occupations programs.

While the above profile may seem to perpetuate the traditional image, changes in occupational opportunities and the expansion of required job skills are sending large numbers in search of more education and training. More employers are offering benefits or on-site training to ensure first-rate employees. The implications and applications for telecommunications follow.

EDUCATIONAL APPLICATIONS

How can we reconcile the premarital differences between vocational education and telecommunications technology? Reconciliation can only come about through a mutual understanding of needs, problems, and aspirations.

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Vocational Education Must Become More Flexible

As financial pressures increase, more students of all ages find it necessary to work, and often it's a full time job. They must rely on finding curricula able to fit into a full schedule. A one day a week seminar might be more accessible than a one semester, three day a week course. Often the professional student is more in need of a review or an update, and not an entire in-depth course of study. Not only is flexibility of scheduling important, but also flexibility of location. A two hour drive twice a week to a night class is not as attractive as a program available at home.

For illustration purposes, consider this scenario. A satellite-facilitated project providing a high degree of flexibility is established. The local library becomes the vocational education facility, offering students the opportunity to enroll in a telecourse. The coursewear is available for use at the library whenever the student is able to come. These videotapes are supplemented with several short live interactive satellite video-teleconferences linking these students nationwide with course specialists who can provide instant feedback simultaneously to many students, without the need to travel to individual sites.

Vocational Education Must Become More Interdisciplinary

Many students find as they enter the labor force they need better preparation in areas besides their own major subject field. Employers are requiring more intrapersonal and communications skills. Technological advancements are imposing new job entry qualifications, particularly in the area of automation. In an age of increasing specialization, the average employee must still be a generalist to interface with his/her co-workers and clients.

More and more is being written about the need for shared resources and institutional cooperation. Satellite communications can provide the link needed to bring student and resource together. Currently, the Association for Higher Education in North Texas (AHE) operates a microwave network among ten academic institutions in the northern Texas area. In addition to these facilities, Texas Instruments and other business and industrial firms also take advantage of this network for training of their employees. Recently, AHE investigated the installation of a satellite terminal to expand the network nationwide. Such a move would open a variety of opportunities for sharing and accessing instructional materials and human resources.

Let's take a closer look at sharing human resources. While it may be financially impractical for a smaller institution to secure the lecture services of a Carl Sagan, for example, several institutions joining together to produce an interactive satellite-transmitted teleconference to several sites provides a cost-effective alternative.

In addition to educational video programs, the development of teletext/videotex provides potential for interactive home reference services. Ted Turner has been testing the feasibility and marketability of encoding such a service in the vertical blanking interval of WTBS, his Atlanta-based superstation, which is distributed nationwide via satellite.

Home media centers will inevitably evolve as the cost of technology decreases and the availability of programming increases. By the year 2000, many homes will be wired for two-way, interactive cable that will deliver not only entertainment and educational programming but such services as home banking and shopping and fire alarm protection. Homes will be interconnected with libraries and other data banks, and the telephone coupled with a display screen will serve as the computer.

Vocational Education Must Overcome Its Inequality of Opportunity

Extending the classroom and the learning resource center into the home is a logical progression of the extension center and mini-campus, and what better way than to use a distance- and terrain-insensitive communications satellite able to penetrate isolated areas most in need. With many vocational education facilities with limited programs located in rural areas, this becomes even more important.

The American Dietetic Association (ADA) is one of a select group transferring its experimental satellite efforts into current routine practice. As certification agent for a profession in need of constant continuing education, ADA has incorporated satellite technology in the delivery of live, interactive tele-seminars. Originating from wherever the program talent is located, these half day to day long seminars are reaching 3,000 dietitians nationwide. Registration and participation in these courses earns the dietitian credit hours toward certification requirements. Such professional education is saving dietitians and their employers time and money otherwise spent traveling to an accredited institution, one which is not always easily accessible. And, with the growth of the Association of Hospital Television Networks, many of these hospital dietitians are able to view the program in the comfort of their own building.

This phenomenon is not limited to professional education. Postsecondary students are also gaining more exposure to satellite-delivered instruction. Recently, three U.S. dental schools teamed up for an instructional teleconference. Mini-segments were presented by each of the three schools from their cities--Indianapolis, IN; Jackson, MS; and Baltimore, MD--to dental students gathered at public television stations all over the U.S.

So far, relatively little has been done directly using satellites for secondary vocational education. Yet, secondary schools are becoming more involved with local cable systems, and satellite technology becomes an easy interface. One high school in northern Illinois has a student-built satellite terminal which has been used to receive programming available from the Canadian ANIK satellite. This experience leads us to ask, "If vocational students can build homes, why not satellite receiving stations?"

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Vocational Education Needs More "Hands On", Simulation, and Innovative Teaching Methods

Vocational education is often called practical, as opposed to theoretical, with some schools ensuring that at least 40 percent of each school day is spent in job-like situations. Work experience, apprenticeships, and on the job training are highly valued, and rightly so. No amount of academic coursework will ever take the place of student teaching for learning the fundamentals of teacher-student relationships. Occupations requiring a great amount of decision-making and physical aptitude are now incorporating more and more appropriate learning experiences in their training.

The increased use of simulation serves as an illustration. If you wanted to learn to fly a plane, you used to have to rely on receiving the flight lessons in an actual plane. Today many pilot trainees can use airplane simulators for much of the training and more practice. Meteorologists used to have to travel to the storms to study them. Now, storms can be simulated in their laboratories. Simulation is providing a very cost-effective method of study from computer simulation, to mechanical simulation, to environmental simulation. Look at the popularity of today's video games--each one a simulation in its own right. And, such simulation often accommodates the needs of special populations such as handicapped students.

How can satellite communications possibly help here? Inject satellite services and you add a new dimension to simulation. For example, an airport disaster was recently simulated, with doctors at VA hospitals diagnosing the victims via satellite. The American College of Radiology has successfully tested the transmission of x-rays via satellite. The University of Colorado Medical School in Denver, a CTS experimenter, demonstrated the feasibility of sharing expensive medical equipment, such as the CAT Scanner, via satellite link. CTS was also used by law students participating in mock trials. Finally, selected pre-medical students from Alaska, Idaho, and Montana, who were seeking admission to the University of Washington School of Medicine in Seattle, were interviewed via experimental satellite.

A NEED FOR AGGREGATION

During its seven years of existence, the Public Service Satellite Consortium has taken pride in helping public service groups apply advanced telecommunications, specifically satellite communications, to their communications needs. Our National Satellite Network (NSN) arm has provided satellite teleconferencing assistance resulting in the coordination of over 200 events, many repeat users. As a membership organization, with over 100 member groups, PSSC can attest to the need for aggregation, cooperation, and shared resources in the application of satellite technology. Not everyone has the means to build a dedicated satellite network, or even to sponsor a teleconference <u>alone</u>, but aggregated with others, such dreams can become a reality.

A PROPOSED NETWORK

In the aftermath of economic constraints, state education departments are finding general budgets being decreased while educational sub-segment support increases, both in public visibility and in need. We now often find separate offices not only for vocational education, but also for bilingual education, special education (gifted, physically and mentally handicapped), migrant education, and other specialized fields. State libraries are often within the education department as well. Since the housing of these offices together is a form of physical aggregation, one potentially viable satellite network could revolve around the linking of all state departments of education.

A satellite terminal would be located on or near the facilities of each department in each of the 50 state capitals. While video programming would be of primary importance, the capability of interfacing the satellite technology with any existing or planned computer technology for high speed data transmission is also a potential use of the network.

Such a dedicated satellite network could service a variety of area users, including departmental offices, staff and constituents; governmental agencies; related professional associations; and educational and library facilities. A shared user fee would reflect the cost-effectiveness of such planned aggregation. The users need not be limited to state groups; many federal government groups need to reach their state counterparts. PSSC recently coordinated a satellite video-teleconferende for the Corporation for Public Broadcasting (CPB) and the Vocational Education Data Service (VEDS) of the National Center for Education Statistics. Participants gathered in state capital cities to discuss statistical reporting on vocational education programs via interactive video-teleconference. Such a program enabled the presentation of information <u>once</u>, simultaneously to all in need, with the added benefit of instant feedback.

THE NEAR FUTURE

As telecommunications costs continue to drop, while satellites become more powerful and earth stations become smaller and less expensive, there is no doubt that satellite technology will be as common and personal as telephones and television sets. Direct broadcast satellites will beam programming to tiny satellite antennas on our roofs. We will use our television sets to learn, to shop, to bank, and to express our opinions on every subject imaginable.

Delivery of instructional materials using a communications satellite will also become more common as it becomes more affordable. But as the information explosion continues to outdate prepared information on a daily basis, we are going to rely more on human resources. The sharing of experts and specialists via satellite will become even more important. Special groups, such as the Institute for Career and Vocational Training, are already looking at the feasibility of linking job banks, career counseling and guidance information, and resources via satellite, particularly since their target audience is American Indians, many of whom

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reside in isolated reservations.

In an era of limited resources, one bright light appears that merits mention. The Annenberg School of Communications has granted ten million dollars per year for 15 years to the Corporation for Public Broadcasting to establish and administer a project to provide American institutions of higher education with a significant new resource of educational programming and to explore and discover new ways to advance American higher education through telecommunications. The goals of the Annenberg project are: (1) to create one or more significant collections of new, innovative, high-quality college-level materials (the term "college-level materials" is understood to include telecourses, radio/audio series, television series, print components and computer materials and might consist of sequences of series/courses, a single series/course, or modules to be used within existing courses, or any combination of the above.); and (2) to demonstrate the use of communications systems for addressing unique higher education problems.

Edgar H. Schein in his report, "Professional Education: Some New Directions," describes the future professional school:

> The new professional school would integrate the basic sciences, applied sciences, and professional skills. A variety of professional degrees would be offered, requiring different lengths of time to complete. There would be a small permanent faculty and a large part-time faculty to permit the offering of a wide range of classes. The adjunct faculty would function like consultants teaching at several different schools and possibly maintaining some private practice as well. Physically, the new professional school would be organized around a "learning resource center" that should include as many laboratories and "application-oriented subcenters" as possible, much like a teaching hospital that is tied closely to various community activities.

We submit one addition to Mr. Schein's description: a satellite terminal near the learning resource center.

ADVICE TO THE LOVE LORN

People in education must learn to speak the language of technology. Technologists, in turn, need a better understanding of public service needs and requirements. Understanding is a prerequisite to marriage. The more you know, the less you distort.

Traditional practices in a technological environment can create conflict. The burden is on the educator. The decision making environment must change to accommodate new technologies. Education must reach out for the non-traditional student and program. We can't apply tomorrow's technology to yesterday's problem.

Historically, innovation in education has been stimulated by some form of subsidy, call it a dowry for illustration purposes. Today, with the economic realities in the federal government, the prospects for a dowry are diminishing. There is no dowry, and to delay the ceremony in hopes of attracting a rich uncle is futile. If education is to systematically enter the world of modern telecommunications, it must take the first step. With any new venture there is risk and there is uncertainty, but the potential return merits action. The field of education as we know it cannot afford to wait. The technology is waiting at the altar and is getting impatient.

SATELLITES: PLANNED AND PRESENT

WESTAR: Owned and operated by Western Union. Twelve transponders each.

- WESTAR I--(launched 1974)--Used for primary PBS and NPR programming, offers some occasional traffic.
- WESTAR II--(launched 1974)--Primarily message traffic.
- WESTAR III--(launched 1979)--Message; occasional, independent, and cable networks.
- WESTAR IV--(~~number~~ launched 1982)--24 transponders.
- WESTAR V--(to be launched 1982)--24 transponde
- Advanced WESTAR--(to be launched 1983)--18 transponders.

SATCOM: Owned and operated by RCA Americom. Twenty-four transponders each.

- SATCOM I--(launched 1975)--Was all cable programming traffic (Cablenet I). Currently being phased into retirement.
- SATCOM II--(launched 1976)--Primarily Alaskan programming traffic.
- SATCOM III--(launched 1980)--Lost during launch.
- SATCOM IIIr--(launched 1981)--Replacement for SATCOM III; now Cablenet I.
- SATCOM IV--(launched 1982)--Cablenet II.
- SATCOM V--(to be launched 1982)--Will be dedicated to Alaskan programming. (ALASCOM I)

COMSTAR: Owned and operated by COMSAT General; leased to AT&T and GTE. 24 transponders each.

- COMSTAR D1--(launched 1976)--Primarily telephone and data service. Eleven transponders were leased to cable programmers due to loss of SATCOM III.
- COMSTAR D2--(launched 1976)--Same as D1.
- COMSTAR D3--(launched 1978)--Primarily telephone and data service.
- COMSTAR D4--(launched 1981)--Primarily telephone and data service.

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AT&T 1--(to be launched 1983).

G-SAT 1 and 2--(to be launched 1984).

SBS: Owned and operated by Satellite Business Systems.
10 transponders each--Ku-Band.

SBS 1--(launched 1981)--Primarily data service.

SBS 2--(launched 1981)--Primarily data service.

SBS 3--(to be launched 1982+).

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ANNEX K

SPECIAL PROBLEMS
IN
TELECOMMUNICATIONS IN RURAL AMERICA

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Developed as part of the background material for a "Workshop on Telecommunications in the Service of Rural Education," 8-9 July 1980, Washington, D. C., sponsored by the National Institute of Education.

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TELECOMMUNICATIONS IN RURAL AMERICA:

SPECIAL POPULATIONS

SPECIAL PROBLEMS

U.S. DEPARTMENT OF EDUCATION
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Submitted to
National Institute of Education
by
Public Service Satellite Consortium
Louis A. Bransford
July 8, 1980

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Telecommunications in Rural America

July 8, 1980

by Public Service Satellite Consortium

Abstract

The disproportionate shortage of health, education and other public services in rural areas is a national concern. In his State of the Union Message, sent to Congress in January 1979, President Carter emphasized the need to address the pressing problems of rural America. In his message, the President pledged to help rural Americans to:

- overcome the problems of isolation;
- promote economic development;
- meet basic human needs;
- protect the quality of rural life;
- assure equity in the administration of Federal programs for which rural Americans are eligible; and
- build a more effective partnership among Federal, State and local governments and the private sector in meeting locally defined rural development priorities.

Telecommunication technology is now being applied on a regular basis to better serve the information needs of people in the fields of entertainment, education, health, government, business and industry. The impact has also been felt by special populations: the aged, the handicapped, the gifted, the linguistically different, the migrants and the veterans. Inject a rural element, however, and the needs and problems are compounded while services diminish.

It is unlikely that telecommunications will be utilized extensively in rural America in the absence of fundamental organizational changes. Use of appropriate labor-saving technology probably would result in productivity gains, but first there must be coordinated planning and agreement on the basic objectives which are to be addressed in the public service.

New alternatives for better serving rural communities must be sought. Only through increased use of telecommunications can equal opportunity be extended to all Americans on an economical basis. The national commitment must be met. Platitudes and good intentions no longer suffice. Innovative ways to resolve the critical issues impacting on rural America must be pursued. The need to upgrade programs and services in rural communities is rapidly moving toward a critical juncture. A rural telecommunication network could be the equalizer.

July 8, 1980

by Public Service Satellite Consortium

Introduction

The decade of the seventies witnessed technological advances in the U.S. which vastly increased productivity in almost every area of human endeavor. The momentum for change was felt throughout but a void remains in rural America. Rural communities, even those with new found prosperity, continue to be technologically undernourished.

The late Peter Goldmark envisioned the creation of a "wired nation" by 1980 that would bring urban centered events to rural America. Mr. Goldmark visualized satellite transmission of health, educational, business communications and other information services that would revolutionize rural America. It hasn't happened.

Few argue that new technologies in telecommunications offer significant possibilities for improving the living conditions of rural Americans. These technologies have the potential not only for providing rural households with more entertainment and public affairs programs, but also for alleviating some of the serious problems inherent in the delivery of education and health services to rural communities.

In Alaska, for example, it has been demonstrated that in emergency situations, paraprofessionals can use telecommunications for obtaining guidance from physicians--guidance which would otherwise not be available. One radio physician team can consult and direct as many as 50 paraprogessionals, each of whom could oversee separate villages of 100 to 200 people.

Advanced education and health-related technologies are in the early stages of development. The emphasis continues to be on demonstration, and as a result has not been available to the public on a general basis. In fact, most rural communities including those in Alaska have never been exposed to new advances in telecommunications in any significant sense (significant defined as continuing operational services).

In most cases where efforts have been made to improve services to rural areas using telecommunications, a government agency has footed the

bill. Low population density has made the development of telecommunications in rural areas relatively unattractive to profit-oriented firms.

Excluding, for a moment, consideration of rural America, the use of communication satellites for delivery of programs and services is very much a reality. The $50 billion plus investment in the space program is now being applied on a regular basis to better serve the information needs of people in the fields of entertainment, education, health, government, business and industry. The impact has also been felt by special populations: the aged, the handicapped, the gifted, the linguistically different, the migrants and the veterans. Inject a rural element, however, and the needs and problems are compounded while services diminish.

When we speak of rural populations, we generally think of communities with populations under 2,000, based on census criteria. However, any analysis of ruralness must include such factors as limited accessibility to conventional modes of transportation to population centers and limited accessibility to communications systems.

Television in rural areas is a good example. Though 98% of all American households receive at least one television channel, as many as 1.2 million rural households are outside the broadcast areas of conventional TV. Those rural families who do receive television programming overwhelmingly receive less than the urban share of channels. A large majority of rural households (14 million, 70%) receive three or fewer channels. By comparison, 65% of all households, mostly in urban areas, receive five or more channels. Overall, including service from translators and cable, the typical rural household receives 50%-60% of the television signals received by urban households. Public television is usually what rural communities don't receive.

Ironically, the low population densities and attendant social service needs make the use of telecommunications in rural areas attractive, particularly in the areas of education and health. It's exciting to talk about, but difficult to implement. This situation is further complicated by the exodus from cities to rural areas. Since 1970, population growth has been greater in rural areas than in urban areas of the U.S.

Introduction. . .

An interesting observation is that many designated rural areas are in reality bedroom communities for a metropolitan community. In an attempt to escape the plight of the city, for a variety of reasons--bussing, smog--families with means are able to live in rural communities while continuing to work in the city. Although their property taxes support the rural schools, this sudden influx has created a burden on existing facilities. It has also presented problems for the schools because the demand for services that were available in the city are not available in rural districts. The focus of this paper, however, will be on rural isolated communities not on bedroom communities designated as rural.

An important dimension of the increased demand and concomitant burden on community facilities is the fact that the median age of the population in growing rural communities is almost two years less than declining communities. Thus, more families with younger children (who will attend school for a longer period of time) are moving into rural areas.

Ironically, large numbers of families that have moved to the country to get away from the city experience a different type of trauma in the transition and ultimately migrate back to suburbia. The rural poor do not have this option.

Rural Telecommunications Network

Why not a rural telecommunications network? In a very simplistic sense a rural satellite network would be feasible if the demand for a specific set of communication services was sufficient to induce a commercial supplier to offer the proposed combination of services at the right price. It does not require another feasibility study to determine that in rural areas, the demand cannot overshadow the price of development. Fewer voices coming from rural America translate into bad potential market surveys.

Rural Telecommunications Network. . .

At the present time, no common carrier appears prepared to provide comprehensive broadband service to rural America. The Bell System now serves 80% of the U.S. population and about 40% of the U.S. geography. Some 1300 independent telephone companies serve 20% of the population and about 60% of the geography. Rural America is essentially served by a large number of small, independent telephone companies, and in the last year the growth of cable systems with satellite earth stations have created an ad hoc rural network for certain program services. Phenomenal growth of telecommunication systems--phone or TV--is catalyzed by population density because the modus operandi, motivated by profit, is subscription service. Telecommunications technology in a dense population quite logically promises more income per capital-outlay dollar. By comparison, much more investment is needed to wire rural America, and the subscription potential is less.

For a broadband (essentially television) rural interconnection network to be feasible, most entertainment and non-entertainment telecommunications services considered desirable by the rural community would have to be conjointly packaged and packaged so most rural areas are attracted. (This could mean a combination of program/information services as apropos to rural Appalachia as to the Northern Rockies--admittedly a difficult package to conjoin.)

In addition to the service package, the legalities of carriage must be faced. Appropriate linkages must be established between the Bell System, the company which becomes principal investor in the rural interconnection network, and the independent telephone companies which now serve most rural communities. Present regulations prohibit a single owner from controlling both the cable TV franchise and the telephone company in a community.

Many proponents of rural telecommunication development feel that federal regulations have been a barrier. For example, the FCC bars cross-ownership of telephone and cable lines. This regulation is presently under review. Although waivers are available in communities where competitive provision of telephone and cable television services is not feasible, the FCC's case-by-case approach and waiver criteria may have discouraged new development.

Constraints

The structure of the present system of public services in rural America, both economically and programmatically, may not be consistent with the requirements of a rural telecommunications network. A classical problem -- too much autonomy, fragmented decision making, piecemeal services. Implementation of a comprehensive information network may face organized resistance and probably will take years to accomplish. The problems encountered in facilitating change are institutional in nature. The lack of a well-developed organizational mechanism to accomplish meaningful change has no doubt impeded progress.

Programs and services in rural communities reflect priorities in non-technical areas; e.g., housing, water, energy, jobs, roads. Although telecommunications technology could alleviate some of these problems, it has not been seen as an important priority in its own right. Telecommunications must be interpreted as a tool to solve problems, not as another problem.

Although there is agreement that federal funds are available to support rural telecommunication, there are numerous problems that have to be resolved before funding can materialize. Most federal monies are funneled through state agencies and then to local agencies. Funding restrictions on capital outlays, duplication of efforts by different social service agencies, and the fickle nature of federal funding patterns perpetuates demonstrations and stifles ongoing, continuous services. Those who have worked in rural telecommunications recognize the need to change attitudes of decision makers regarding technology. There is still a feeling that telecommunication alternatives are not yet viable possibilities, other than for demonstration. There is a reluctance to invest in hardware when people perceive the system as experimental. There is a feeling that innovation, per se, does not necessarily improve quality or reduce costs. A very good case and tremendous patience will be required to aggregate the resources and requirements of the public service community.

Satellite Communications

Communication satellites would definitely play a critical role in the creation of a rural telecommunications network. Satellite communication has several characteristics that make it very attractive to organizations which are concerned with health care, education, library service, public safety, business and industry. These advantages are most apparent when the organization is attempting to deliver services over large, sparsely populated areas, where distance-insensitive satellite service is a significant factor.

Satellite systems are also flexible. New points can be added to a network by installing an earth station, without regard to the difficulties of distance and terrain which plague the installation of terrestrial systems. This feature is particularly important in rural areas. The availability of smaller, simpler and less expensive earth stations, make this characteristic ever more attractive today.

Satellite carriers provide more flexible interconnection arrangements to owners of local broadband networks than terrestrial carriers. The advent of Cable Net II, hotel networks and other dedicated distribution systems offer the client in the population center a number of attractive alternatives. Broadly speaking, satellite carriers offer "bandwidth in bulk," while terrestrial carriers offer individual services.

Certain public services are not desired or required because people are not aware or because it has not been feasible to provide such services. Flood control was demanded as soon as people figured out how to do it. Broadcast news became a public requirement as soon as radio made it possible. Because of space technology, we have the communications capability to address a number of problem areas previously unattended: disaster relief, search and rescue, navigation, cargo tracking, monitoring of water supplies or forest fire conditions, and emergency medical service. Solutions exist and services are possible, but only public demand will stimulate the inertia to generate change.

Satellite Communications. . .

Every satellite system in existence has been formed around an organizational and financial backbone. The Intelsat system was able to expand quickly during the mid-1960's because NASA required reliable communications to support the Apollo missions. The domestic systems in the Soviet Union, Canada, and Indonesia were built to serve a defined government market for communications. The Marisat system was made possible due to the early support of the U.S. Navy. Closer to home, no one will argue that the Public Television Satellite System established WESTAR. Similarly the RCA/SATCOM network would still be in the red today without the cable system connection.

Advocates of a rural satellite network argue that subsidization is needed to establish the system but that recurring revenue from operational services would realize a self supporting enterprise.

Rural Education

Rural education is particularly amenable to the use of telecommunications technology primarily because of the inaccessibility and inequality which characterize the conventional education in rural America. Rural areas, by the very nature of their geographic isolation, have unique educational needs.

The Office of Technology Assessment study on "The Feasibility and Value of Broadband Communications in Rural Areas," found the two major factors influencing quality and access to education in rural areas are economic characteristics of the community and organizational structure of educational systems. The importance of economic characteristics lies in the fact that major financial support for education comes from the local community. Approximately half of all funds supporting public elementary and secondary education are obtained from local sources. State governments contribute an average of 42% and the balance comes from the Federal Government.

Although it varies from state to state, the Federal Government contributes only a small amount (roughly 10%) of support for education.

Rural Education. . .

Equal educational opportunities cannot be guaranteed for poverty areas when the federal contribution provides only 10% of an already shrinking educational budget.

Revenue for local school systems in nonmetropolitan areas is financed primarily by property taxes. However, 60% of the nation's substandard housing is in rural areas where only 20% of the federal housing assistance dollars are channeled. The disparity is obvious. There is a limited tax base to generate local economic support of rural educational systems. In addition, rural communities have a lower per capita income and a higher incidence of poverty than metropolitan areas.

Certification issues can also restrict the use of telecommunication systems. Funding patterns perpetuate the traditional classroom unit which requires a certified person in each classroom to comply with funding regulations. Education is labor intensive -- more so in rural schools. Although telecommunications can help to alleviate the problem, it's a delicate issue. With cost containment becoming a major factor in our schools, something must be displaced to accommodate use of telecommunications as an alternative. The biggest line item in any school is personnel. A 5% line item transfer of funds may not significantly affect a large school district, but it can be devastating to a small school district. Similarly, 5% of a large school district's budget is theoretically enough to acquire just about any new technology, but 5% of an already limited budget won't buy much in a small rural school.

It is not uncommon for school districts to allocate 80% or more of their budget to salaries; and, because the total budget is relatively small in most rural districts, teachers often receive proportionately lower salaries. This, then, leaves 20% of the budget for all remaining expenditures, including facilities, equipment, programs and curriculum materials. Without subsidization, additional capital outlay for advanced technology is virtually impossible.

Educational Administration

Education has undergone profound internal alterations in the last decade. The impact on school administrators has been significant. With all the changes in society today, many of which intimately involve public education, school administrators are being confronted with a multitude of problems.

The most troublesome issues include enrollment shifts, a surplus of teachers, or inability to attract teachers, increasing specialization, civil rights, collective bargaining, accountability, discipline problems, desegregation, energy conservation, and new funding patterns. Perhaps the issue that is most familiar to the traditional administrator is parental concern for quality education. The "back to basics" movement is all too familiar to the school administrator.

A school administrator, particularly in a rural school, needs improved access to information. An occasional workshop for administrators is inadequate. The answer may be found in a rural telecommunication network. Such a system could provide relevant, up-to-date, and economical information to rural school administrators.

A rural telecommunication network with interactive computer capabilities could be used to monitor student progress and give options for further study. The rural information network could be used to reduce administrative paperwork. School administrators are burdened with reporting information to state and federal agencies on a variety of subjects: student and teacher personnel data, attendance data, and financial reports. While a centralized computer storage and retrieval facility normally is available to larger school systems, the rural school administrator still must operate a paper-pencil-mail delivery mode.

A rural telecommunication network could be used to facilitate communications between state agencies and school personnel. State agency planning and school service personnel need to communicate frequently with school personnel, counselors, administrators, school boards, citizen accountability committees, and teachers. The wideband distribution capability of satellite systems also offers an economical alternative to travel. State

and regional educational agencies could more readily interact with rural schools on topical issues, trends, and concerns.

Migrant Education

Rural schools are also plagued by the mitigating problems associated with migrant populations. Approximately 1.4 million people in the United States are migrant workers; that is, agricultural laborers who move to find work wherever there is a seasonal demand. These migrants include Chicanos, Blacks, Indians, Puerto Ricans, and Anglos. They move in three broad streams from Florida, Texas, and California through forty-seven states.

Predictions on the future magnitude of the "migrant problem" vary. At first glance, the migrant population appears to be decreasing as a result of the increased use of agricultural machines and the reduced need for field labor. A closer inspection, however, reveals that the migrant population is growing because single male workers are being replaced by entire families. It is unlikely that this population will decline for at least ten to fifteen years.

The problems and needs of migrant workers and their families probably have not increased in recent years, but the nation's concern for them has. The emergence of migrant spokesmen, a heightening consciousness of civil rights, and the publicity given to these issues, have all contributed to growing political pressures for programs to better serve migrant families.

The primary needs are common to all states with sizable migrant populations: adequate housing, basic health and nutritional services, appropriate educational opportunites, information regarding employment standards, and assistance. Although most states allocate resources to meet "primary" needs, funds are either unavailable or inadequate to address the educational needs of migrant children.

Those states with a substantial migrant poulation, of course, cannot overlook that group's special needs while other services are initiated and expanded. More effective use of telecommunication technology would expand and improve services and programs to the migrant population. The need for

a relevant program plan, however, is a prerequisite. To date, excluding isolated attempts to utilize mediated instruction, there has been little evidence of any concerted effort to apply labor and cost-saving technology to the problems inherent in migrant education.

The Migrant Student Record Transfer System, an intersate system located in Little Rock, Arkansas, computes and analyzes information on the migrant population. The need for such a system is critical, since there is evidence that migrant children have been re-innoculated or re-tested because of a clinic's or school's inability to obtain updated records. Record keeping is a difficult problem. The migrant family does not usually announce its arrival or departure, creating an additional time lag between arrival, identification of needs, and commencment of service delivery. Immediate access to a comprehensive data base could enhance educational service delivery to migrant children by reducing duplication in record keeping and by providing continuity to the curriculum. Federal assistance is available but eligibility is essentially limited to local and state education agencies, thus diminishing possible impact on inter-state migrant requirements.

Fragmentation of services and programs at the state and local level further compounds the problem. In most states, it is unclear where responsibility for migrant services lies. The taxpayers in general, and employers in particular, are wary of providing additional services, which will entail restrictive state and federal regulations. Except in those states where migrants return after the harvesting season, the problem does, after all, disappear for much of the year.

In the face of these realities, relevant programs and services for the 500,000 migrant children seeking an education are rare. The lives of migrant children are commonly unstable, uprooted and chaotic; their school attendance is likewise sporadic and inconsistent. Ninety percent of these children never finish high school and their average education level is fourth or fifth grade.

Migrant Education. . .

The problem of providing services to migrant youngsters is national in scope, interstate in nature, and rural in application. There is little likelihood that the necessary programs will be adequately funded either by the Federal Government or by individual states. Migrants pose an unique and complicated problem because they generally cross several state boundaries. In addition, accurate data on their numbers and travel patterns are almost nonexistent. Intrastate workers -- those who may travel substantial distances but do not cross state lines -- may not be counted at all.

There is an obvious need for some mechanism to coordinate and aggregate the existing resources, and in turn provide a better means of service delivery to migrant populations. Appropriate use of telecommunications could dramatically upgrade the level of service to migrant populations. The same system could be utilized in a wide range of applications in rural schools.

Special Education

It has been well documented that individuals with mental or physical handicaps are often excluded from schools and educational programs, barred from employment, or are under-employed because of archaic attitudes and laws, denied access to transportation, buildings, and housing because of architectural barriers and lack of planning, and discriminated against by public laws. The American public, in general, is simply unfamiliar with and often insensitive to difficulties which confront individuals with handicaps. When by chance or circumstance the handicapped individual lives in rural America, the problems are magnified.

In the United States, there are an estimated seven million deaf, blind, mentally retarded, speech impaired, motor impaired, emotionally disturbed, multiply handicapped, or other health impaired school-age children. In addition, there are an estimated one million pre-school handicapped children who require special education programs. These children represent approximately 10% of the school-age population, and although the number of handicapped children receiving special education services has increased, only about 40% of these children are receiving an education which is

Special Education. . .

designed to enable them to approach their maximum capacity. Additionally, there are an estimated one million handicapped children who are totally denied access to a free public education. Further, there are an estimated 125,000 mentally retarded, emotionally disturbed, and physically handicapped children who live in state institutions where most education programs are inferior or nonexistent. The implications for the handicapped in rural America are evident.

Theoretically, any program or service for the handicapped available in the cities could be adapted for use in rural schools. But new methods for serving the educational needs of rural communities are needed. To support any comprehensive instructional delivery systems there must be an array of special services and programs. As teachers individualize instruction for pupils and as schools provide more instructional services for individual pupils, there must be an effective system for delivery of special information and materials to teachers and pupils. Services include special transportation, special seats, electronic communications equipment for health and education, consultative services, instruction for homebound students when necessary, public information, etc. Access to services and programs not readily available, or difficult to justify because of geographic constraints or low incidence, could be shared with other communities through use of telecommunications.

Gifted Education

The rural isolated gifted child presents another unique problem. Most schools cannot afford to single out one or two gifted children for special help; there may not be enough gifted children in the whole school to justify the extra time and expense of identification, let alone special treatment. In addition, many rural teachers, because of their relative isolation may not be aware of existing enrichment resources for the gifted and many schools interpret the symptoms of the thwarted gifted child as behavioral disorders.

Gifted Education. . .

Gifted children demonstrate a wide variety of exceptional talents, only one of which could be called "academic." Academic talent is widely accepted as a main characteristic of gifted children. Most teachers are already aware of, and to some extent prepared to cope with, the heightened intellectual or academic, ability of some children. But what about the highly creative or artistic child who is visually oriented, or the child who is performance oriented, who is physically expressive, or the child who has exceptional spiritual or social perceptivity?

Telecommunications can be the vehicle for enriching the curriculum in rural schools. A variety of enrichment programs could be transmitted to any participating school. The interested child could elect to watch selected programs, providing a way for schools to bypass the additional responsibility of devising a new curriculum. Teachers in rural schools admittedly over burdened would be relieved of the extra pressure of developing special materials for the one or two students who seek special challenge. An interactive system would also enable a gifted student to converse with experts in the special fields of study.

New alternatives for serving the educational needs of rural communities must be sought. The national commitment to equal educational opportunity must be met. Platitudes and good intentions no longer suffice. Innovative ways to resolve the critical issues impacting on rural education must be pursued. The need to upgrade educational programs, services, and teacher training in rural communities is rapidly moving toward a critical juncture. A rural telecommunication network could be the equalizer.

Public Television in Rural America

The need to extend public television service to geographically isolated communities has been well-documented in the past; however, service has not been technically or economically feasible. In 1978 the PSSC, under contract to CPB, examined operational alternatives for extending or improving public

television service to rural communities in Wyoming, Montana, and the Appalachian region. The study, "Public Television Service in Rural America," was given impetus by recent developments in telecommunications technology.

A very simple rationale: high-powered satellite systems and lower-cost earth stations make it possible to receive television programs directly from the satellite in areas which are not served by existing public television stations. The public television satellite system provides an opportunity to initiate an operational scheme to extend public television to rural America.

As part of the study, data was compiled on technical and financial requirements for receiving public television using small earth stations in conjunction with mini-transmitters, cable systems, and translators. Community interest and willingness to support public television were also examined.

Findings from the study reinforced what was already known. Commercial television is now available in most rural communities because of cable and translator service. It may be poor or spotty, but it's there. Public television, on the other hand, is still not available in most areas of Montana and Wyoming. Public television in Appalachia is more prevalent, however, the signal quality is poor in many rural, isolated communities.

The study was completed to fulfill the contract with CPB. PSSC, however, was encouraged to proceed in developing an operational plan that would facilitate extending public television to selected rural communities in Wyoming and Montana. CPB committed funding for planning activities. The National Telecommunications and Information Administration's Public Telecommunications Facilities Program made encouraging sounds about funding equipment and facilities. Several other timely events provided additional impetus.

The public television satellite system, which interconnects the nation's public television stations via Western Union's WESTAR satellite,

became operational in 1978. The WESTAR signal covers all of the United States -- all of it, including rural America. Contributions from rural America helped pay for this system.

The proliferation of small earth stations and the de-regulation of licensing of receive only earth stations were other contributing factors. Another significant event was the December 8, 1978 FCC decision that allows translators to receive an FM microwave signal -- or essentially a satellite signal. Previously this was not allowed. It was also recognized that problems regarding program rights and distribution, as well as a number of regulatory problems which restrict public television distribution using small earth stations, translators, cable, and mini-transmitters would need to be resolved.

A more fundamental issue remained: dollars. There is now an expanded funding base to support telecommunications activities in rural America. The big plus could be the Public Telecommunications Facilities Program (PTFP). The facilities program, transferred from HEW to the National Telecommunications and Information Administration (NTIA) in the Department of Commerce, provides fund for facilities and equipment for the extension of public telecommunications services to as many citizens as possible. Telecommunications services are defined as noncommercial educational and cultural radio and television programming and related noncommercial instructional or informational materials.

Previously PTFP funds were earmarked exclusively for public radio and television station activiation or expansion. The new regulations provide greater latitude. It "permits for the first time Federal funding for the nonbroadcast distribution of noncommercial educational and cultural radio and television programming and related noncommercial instructional or information materials." It also "provides that not less than 75% of appropriated funds shall be available for the extension of public telecommunications services to areas not presently receiving such service." Other agencies will now be eligible. A community translator association is eligible; this was not so before.

More importantly, the number one priority for PTFP specifically addresses the needs of rural America. "Priority I - Provision of Telecommunications Facilities for First Service to a Geographic Area." Within this first priority, three subcategories will be established: (a) "Projects to establish telecommunications facilities which include local origination capacity." (b) "Projects to extend existing telecommunications delivery systems." (c) "Projects to establish telecommunications delivery systems without local origination capacity."

In the spring of '79, PSSC prepared and submitted a proposal for PTFP funds on behalf of 3 rural communities in Wyoming and 7 in Montana. The requested funds would be used to procure and install small earth stations and the associated electronics to enable each of the communities to receive and broadcast public television programs.

The plan was for PSSC to assist the communities in acquiring the necessary equipment. The earth station and mini-transmitter, however, would be licensed in the name of an appropriate community agency. Ownership of the equipment would also be in the name of a community agency. PSSC would provide the necessary assistance to license and install the equipment and, if needed, would provide subsequent maintenance support to the community, under a separate contract.

The proposal process was cumbersome. The task required to complete FCC forms to construct and license the earth station and the translator (min-transmitter) in each community was mammoth. There were over 500 pages of forms for each community. Such a requirement is enough to discourage even the most enthusiastic of communities. When even copying is a problem, it is unrealistic to expect a small rural community of a few hundred people to complete the forms without assistance. This has a direct bearing on funding because without forms the bureaucracy does not function.

The proposals were submitted, reviewed and accepted conditionally. However, a new problem was created by PTFP. The staff determined that the grants could not be made unless a program service was identified and approved. The applications had identified several programming sources, such as individual licensees, regional networks and the Public Broadcasting

Service basic feed. One station, KRMA in Denver, Colorado had agreed to allow its broadcast schedule to be utilized. But, by solving the program rights problem an economic problem, namely, the cost of a transponder was created.

In the short term, until a rural program service could be established on an individual channel, the only available program service would be the PBS basic feed. The grants were denied in 1979 with assurances that funding would be available subsequently if the program access issue was resolved. In early 1980 PSSC resubmitted the proposals on behalf of all ten rural areas. Concurrently PSSC petitioned PBS to allow unmanned small earth stations to receive public television programs directly from the WESTAR satellite. The Distribution and Support Service committee reviewed the request and directed the staff to study the implications further. The committee said it was concerned with efficiency, localism and precedent setting. To compound the PBS negative decision, FCC staff waffled and all ten applications were in jeopardy once again. It was assumed that the problem of licensing mini-transmitters had been solved. Initially FCC staff indicated there would be no difficulty licensing the low powered mini-stations since a precedent had been established in Alaska. Recently because of related licensing problems the FCC has refused to rule on such applications pending an exact rule making about low powered transmitters. Consequently because PTFP cannot reserve funds, the proposals were not approved.

Further study was not required, the implications were clear. Most rural communities do not receive public television. The ad hoc distribution system proposed by PSSC could have alleviated the problem. There is no sound explanation for the PBS or F.." decision. Establishing a precedent is not a valid reason. The inherent problem surfaces when one probes the politics in public broadcasting. The initiative for this activity came from CPB. They supported a study "Public Television in Rural America" in 1978. Subsequently, funding proposals and FCC applications for first time public television service were prepared and submitted. It was not designed as an experiment or demonstration. It would be an operational service though it would not be the ideal system. Scheduling would present minor

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problems, and momentarily losing the signal between programs could be an aggravation, but the rural viewer has learned to cope with electronic adversity and would accomodate. When a signal is available they will watch it. It is also reasonable to expect that such problems would be alleviated as the service evolved. Unfortunately the bureaucracy prevailed and once again at the expense of rural America.

Conclusion

Ten small earth stations located in rural Montana and Wyoming cannot be construed as a telecommunication network. The experience, however, in attempting to solicit funds, acquire program rights and resolve regulatory problems will have proven invaluable if and when a rural telecommunication network is launched. The experience also suggests additional study. Certain questions need to be answered. *What are the major factors which will influence implementation of a rural telecommunications network? What commercial, noncommercial, and entertainment services appear to be most amenable to aggregation in rural America? What options are available to finance the network? What is the ability and willingness of rural users to pay for services?*

It is unlikely that telecommunications will be utilized extensively in rural America in the absence of fundamental organizational changes. Use of appropriate labor-saving technology probably would result in productivity gains, but first there must be coordinated planning and agreement on the basic objectives which are to be addressed in the public service.

Without diminishing the potential of telecommunications technology, adoption by public agencies is a slow process. When the setting is a rural environment, the pace of progress is even slower. The organizational and institutional factors which constrain adoption of new technology are complex but not insurmountable. Despite the inherent difficulties encountered in facilitating change and adopting innovation, telecommunications holds real promise for alleviating many of the problems in rural America.

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ABSTRACT

During the past decade, satellite technology has grown increasingly more sophisticated. Satellites are being used in public interest activities, especially through the Public Service Satellite Consortium. But what about the field of education? How can education, especially vocational education, make use of satellite communications technology? In order to make this technology work for it, vocational education will have to make some changes. It must become more flexible, more interdisciplinary; it must provide more equal opportunities; and it needs more "hands on" experiences, simulation, and innovative teaching methods. In order to make use of satellite technology, educational personnel will have to consolidate their efforts. A satellite network could be used by several educational services, with perhaps a satellite terminal located in vocational education departments in each of the 50 state capitals. As satellite telecommunications costs continue to decrease, satellite use will become more common. Vocational education must be prepared to make use of this innovative new resource. (A list of planned and present satellites is contained in this report.) (KC)

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